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COMMERCIAL FISHERIES REVIEW

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COMMERCIAL FISHERIES REVIEW

A REVIEW OF DEVELOPMENTS AND NEWS OF THE FISHERY INDUSTRIES
PREPARED IN THE DIVISION OF COMMERCIAL FISHERIES

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COMMERCIAL FISHERIES REVIEW

June 1947 Washington 25, D.C. Vol. 9, No.6

A TECHNOLOGICAL STUDY OF THE OCEAN QUAHOG FISHERY

By W. Arcisz* and L. A. Sandholzer*

ABSTRACT

The ocean quahog (Arctica islandica) offers an excellent source of food and the industry developed around this mollusk during the recent war appears to be sufficiently stabilized to make it an integral part of the Atlantic Coast fisheries. The technological aspects of the ocean quahog are discussed in this report. This includes methods of catching, processing and marketing, along with certain economic considerations.

The sanitation problems of the industry have been carefully investigated. The bacteriological data are presented in detail in order to indicate the major sources of difficulty. It was found that methods of storage, lack of adequate refrigeration and certain plant practices were responsible for most of the losses in sanitary quality which have been reported. Methods for eliminating these difficulties are indicated at the end of the report.

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The presence of the ocean quahog, Arctica islandica, in the waters of Rhode Island and adjacent areas has been known for some time. It was not until May 1943, however, that this shellfish was exploited as a food resource. At that time, under the impetus of the war food program, commercial utilization of this clam was initiated. Although a newcomer in the shellfish field, it has already established itself commercially and it may continue to be found in the market for years to come. Because of its abundance, large size, and fine flavor, it has found a ready acceptance among processors of chowders and related shellfish products. On the other hand, its texture limits its possibilities to this restricted field.

In order that the industry which was developing around this shellfish might produce a safe, wholesome product, the U. S. Fish and Wildlife Service in cooperation with the State of Rhode Island, from October 1943 to November 1944, undertook an investigation which included technological and bacteriological studies. From the results, it has been possible to indicate the sources of potential difficulties and to permit the industry to produce a first-class product.

The technical findings of the ocean quahog investigation are presented in this report. A previous publication by the Rhode Island Division of Fish and Game, (1945) presents, in a more popular form, a survey of the industry based on the findings of the same investigation.

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PART I

The ocean quahog[1/] belongs to the family Pleurophoridae (Pratt, 1935) which includes all bivalves with the mantle lobes united posteriorly by a curtain pierced with two siphonal orifices. All of the species in this group have a foot which is thick and tongue-shaped. There are two large unequal gills on each side which are united behind, forming a complete partition (Tryon, 1873).

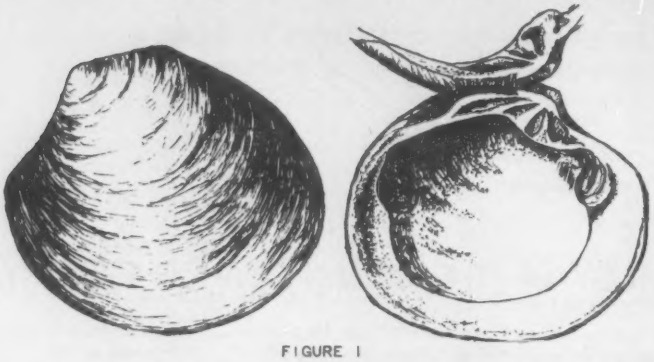

FIGURE 1

The distinguishing anatomical features of Arctica islandica have been described by Adams and Adams (1858) and Tryon (1873). The shellfish has a large, thick, ponderous shell with incurved, contiguous, prominent beaks. Tryon gives the average dimensions of the shell as 3.3 inches in length and 2.8 inches in width. The shell is covered with a coarse, wrinkled epidermis which is black but shades into an olive brown towards the margin (Fig. 1 and 1A). The umbo occupies a central position, and the hinge contains three

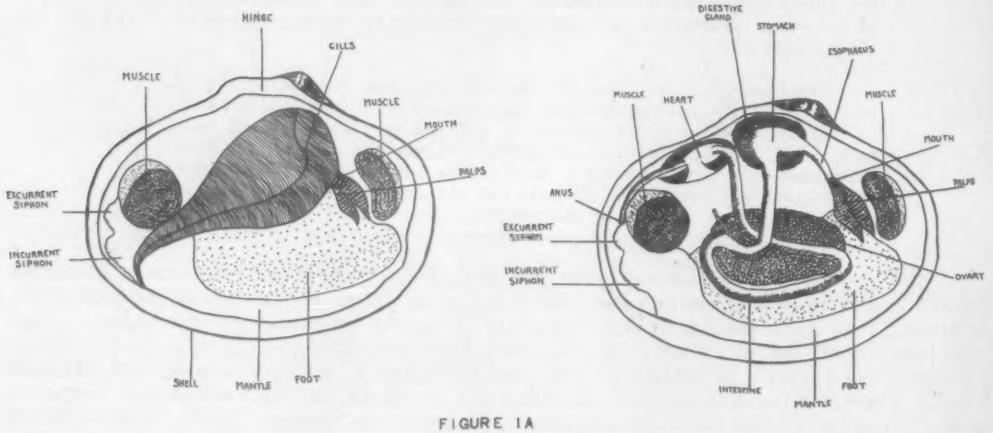

FIGURE 1A

diverging cardinal teeth. There is also one posterior tooth in each valve. The mantle is open in front and beneath, but is united behind by a curtain. The siphons are short and compressed with ciliated orifices. The anal orifice is narrow and conical with short cilia crowning the apex. The gills are large and quadrangular, unequal in size and are united posteriorly. The foot is thick and linguiform.

Although originally believed to be a strictly European species (Adams and Adams, 1858) it is now known that the ocean quahog is widely distributed in the

1/ Common name accepted by the U. S. Food and Drug Administration, 1944. Letter to the Chief of the Division of Commercial Fisheries authorizing the use of the name "ocean quahog."

waters of the North Atlantic. It has been reported from the Scandinavian coast, Greenland, and North America. In general, it has been found to inhabit the muddy bottoms of the colder areas of the Atlantic Ocean, but the north-south limits of its distribution have not yet been determined.

Commercial fishing operations have been limited thus far to the off-shore waters of Rhode Island and southern Massachusetts (Fig. 2). The Rhode Island State College and commercial interests have located several areas which are of

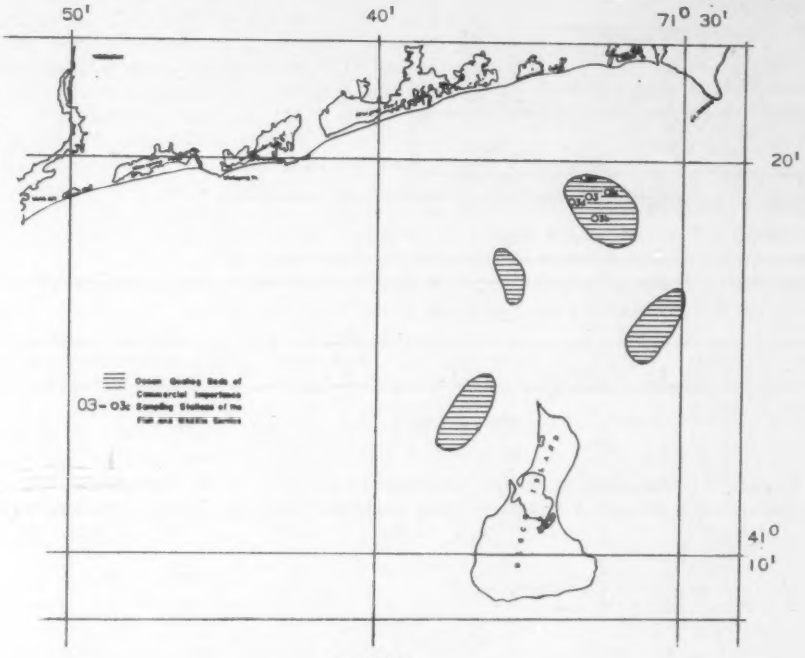

FIGURE 2

commercial importance. Originally, only two areas were fished, one of approximately 8¼ million square yards, located three miles southwest of Point Judith, and another of about 4½ million square yards, southeast of the Point Judith Whistling Buoy. These beds are found at depths ranging from 80 to 120 feet. During 1943, these two beds yielded about 50,000 bushels of ocean quahogs and can still yield catches of commercial importance. However, the dredging operations have left considerable shell debris and so these beds are not being used extensively at present. Since January 1944, new areas of commercial significance have been located near Newport, Sakonnet Light, Vineyard Light, and Block Island. An extensive bed has been located between Gay Head and Cutty Hunk Island.

The Rhode Island State College has made surveys of several potential production areas using a reconstructed quahog dredge of two bushels capacity. The data analyzed by type of bottom are indicated graphically in Figure 3 (see p. 4). The smallest average yields were obtained on stony or rocky and hard sand bottoms, the average catches being 6 and 5 specimens, respectively, for a 4-minute dredge. Loose sand, sand and mud, and clay and mud bottoms gave average yields of 16, 31, and 27

quahogs for the same length of time. The highest average yield was obtained on "sticky" mud bottoms where 41 specimens were caught on a 4-minute drag.

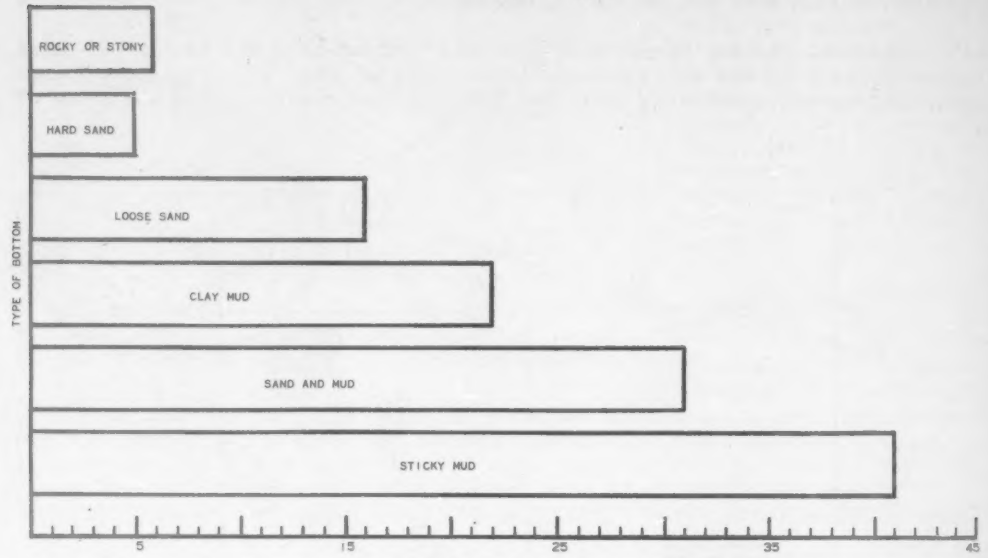

FIGURE 3 - AVERAGE NUMBER OF QUAHOGS CAUGHT IN 4 MINUTES OF DREDGING

In Figure 4, the same data are indicated in relation to the water depth. Very few specimens were caught in waters less than 80 feet in depth, the average hauls

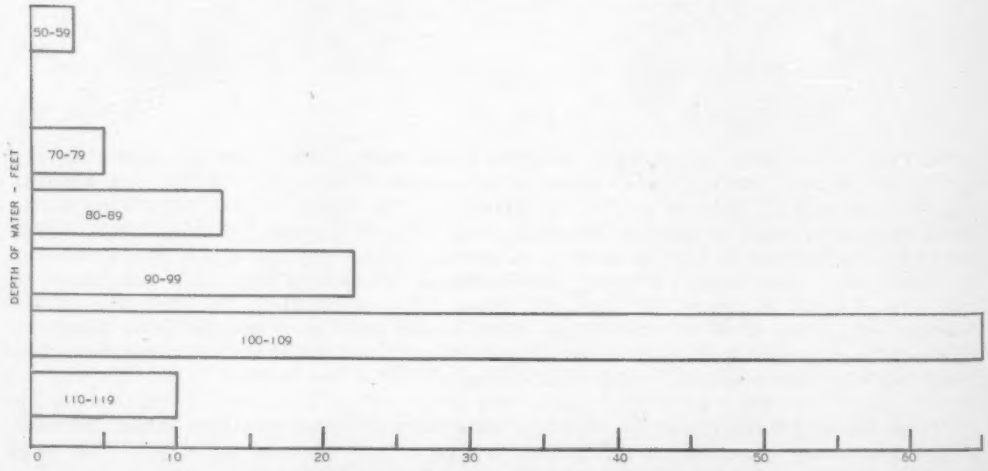

FIGURE 4 - AVERAGE NUMBER OF QUAHOGS CAUGHT IN 4 MINUTES OF DREDGING

being 3 per 50-60 feet of water and 5 per 70-80 feet. Between depths of 80 and 90 feet, an average of 13 specimens was taken and an average of 22 was obtained

in 90-100 feet. The largest haul was made between 100-110 feet, the average number of specimens being 65. Beyond this depth, the average dropped to 10 quahogs (110-120 feet) per 4-minute drag of the dredge.

Dredging for ocean quahogs is similar to the power dredging of the bay quahog as practiced in the inshore waters of Rhode Island and Massachusetts. The only difference is that the ocean quahog is taken in 80-120 feet of water instead of 18-30 feet. The boats used are regular fishing vessels of the dragger type (Fig. 5), being 40-50 feet long. A few 60-65-foot oyster boats also have been converted for ocean quahog operations. The boats are powered with gasoline or Diesel engines of 40 or more horsepower. The strain put on the vessel by dredging is severe and the masts have to be sound and well stayed. The smaller boats are usually manned by a captain and a crew of two men. The larger boats usually have a crew of three in addition to the captain.

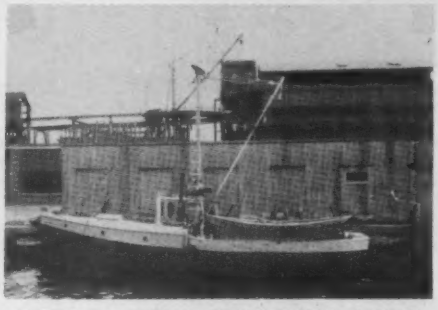

FIGURE 5 - TYPICAL OCEAN QUAHOG DREDGER

The dredges used are of the Nantucket type and are known as "rocking-chair" or "queer" dredges. In operation, they act as a multi-toothed plow which digs through the bottom and scoops the animals into an attached chain bag. These are custom-built and cost from $100 for a 12-toothed dredge to $130 for a 20-toothed instrument, complete with chain bag. The teeth are 7 inches long and are spaced 1½-2 inches apart. The bottom of the dredge has two channels which are weighted with about 100 pounds of lead. The bag, made of steel

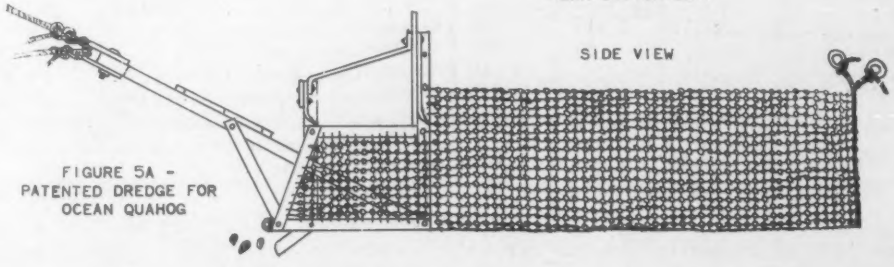

FIGURE 5A - PATENTED DREDGE FOR OCEAN QUAHOG

rings, 2 inches in diameter, is attached to the dredge and is equipped with a purse-string arrangement (Fig. 5A).

The dredge is operated from a power winch driven by the boat engine. The winch has a single cable drum equipped with either a hand or foot brake. The

drum houses 50 fathoms of 7/16-inch cable which is used for raising and lowering the dredge. The cable is fed from the drum through a block secured to the mast. It then runs through another block on the boom and thence to the towing arm of the dredge. The dredge is towed by a rope attached to the towing arm and fastened to the Sampson post of the boat.

FIGURE 5B - LOWERING THE DREDGE

In operation, the dredge is lowered over the side and dropped to the bottom. It is then towed for 15 minutes. At the end of this time, it is raised and the mud removed by rinsing the loaded dredge in the water several times. The dredge is then lowered on the deck and the catch is dumped by releasing the purse string. The dredging is repeated while the catch is being culled and bagged (Fig. 5B).

Since these quahogs are found outside of the 3-mile limit, the State statutes regarding inshore dredging do not apply and so the length of the season and size of catch are not legally restricted. Because of poor weather, however, the actual dredging time is limited to an average of about 17 days per month. The annual average catch per boat is about 71 bushels per day. The monthly and daily records of the dredging operations are shown in Tables 1 and 2.

The culled catch is placed in bags containing one bushel each (90 lbs.) and these are stored on the deck of the boat without any protection from the weather

Table 1 - Production of Ocean Quahogs by Months During 1943

Month	Distribution		Month	Distribution	
	Military	Civilian		Military	Civilian
	Gallons	Gallons		Gallons	Gallons
May	1,238	248	September	60	9,329
June	80	5,798	October	1,745	4,534
July	-	8,441	November	4,204	1,275
August	-	3,810	December	7,033	1,887
	1,318	18,297		13,042	17,025
			Grand total	14,360*	35,322**

*Frozen in 1 gallon metal containers containing 8 pounds.
**Frozen in 5-pound paper cartons - 5,625 gallons; fresh in 1 gallon metal containers - 29,697 gallons.

and without refrigeration. The bags are stacked on top of one another so that there is little opportunity for air to circulate between them. Upon arrival at the dock, the bagged catch is transferred to a closed truck. No refrigeration is employed[2] and in warm weather this operation is equivalent to placing the quahogs in an incubator. The period of truck transportation varies with the distance to the plant. Occasionally, the catch is kept in the truck for as long as 2 or 3

2/Since this paper was written, one of the leading producers has started using refrigerated trucks for hauling.

days. The quahogs are without refrigeration throughout this time and no ventilation is provided. Because of this, many specimens have to be discarded when the bags are finally opened.

Table 2 - Data on Daily Dredging Operations by Months During 1943 and 1944

Month	Days Fishing	Average Boats Per Day	CATCH Average Per Day	CATCH Average Per Boat	CATCH Total
1943	Number	Number	Bushels	Bushels	Bushels
June	16	4	273	77	4,385
July	16	5	300	58	4,809
August	18	6	371	66	6,681
September	14	6	391	70	5,487
October	18	3	254	75	4,576
November	18	4	258	70	4,659
December	23	4	382	81	8,804
1944					
January	20	4	568	189	11,359
February	19	3	291	102	5,643

Storage at the processing plants may not be much better than that on the vessel or truck. The bags are frequently piled on the floor of the warm or heated shucking house and are kept without ventilation or refrigeration until shucked.

The shucking operations are very similar to those employed with other shellfish. The shuckers supply themselves with shellstock by carrying a bag over to the bench. The quahogs are dumped out and are washed free of mud and detritus with running water. The meats are shucked into gallon containers. In some plants, the shell liquor is saved, but this is not common practice. (A 90-pound bushel of ocean quahogs yields about 1½ gallons of drained meats, or about 12 pounds.)

The shucked meats are delivered to a packing room where they are dumped onto a perforated metal platform and washed with fresh water before being packaged. After packaging, they are refrigerated.

Very few ocean quahogs are sold as shellstock (1,043 bushels in 1943). The majority of the catch is sold as either fresh or frozen meats. The fresh quahogs are usually sold in 1-gallon, single-service, or returnable metal containers. Gallon packages usually contain 8 pounds of meats. The frozen stock is packaged in either 1-gallon metal cans or in 5-pound paper packages. The sales for 1943 of the different types were:

Fresh - 1-gallon containers - 15,687 gallons
Frozen - 1-gallon containers - 36,360 gallons
Frozen - 5-pound paper cartons - 5,625 gallons or 45,000 pounds

The economics of the ocean quahog industry, at the time this report was written, are summarized in Table 3. The catch of the smaller boats (40-50 feet) averages between 100 and 150 bushels per day of actual dredging; that of the larger boats averages between 200 and 250 bushels. The price per 90-pound bushel varied between $1.00 and $1.40 with an average, in 1943, of $1.25. A bushel of shellstock yields 1½ gallons of meats and the cost of shucking is 35 cents per gallon. An average shucker can produce an average of 32 gallons per day. The price of the final product, whether fresh or frozen, has varied from $3.00 per gallon in 1943 to a price of $1.75-$1.85 to large consumers and $2.50 per gallon to small consumers. The number of processors has varied but only two have succeeded in maintaining high production. Ocean quahog production is seasonal for two reasons.

Generally speaking, the best weather for dredging occurs during the summer months and secondly, at this time the oyster shuckers are available to the ocean quahog industry.

Table 3 - Commercial Statistics on Ocean Quahog Industry 1943-44

Average number of fishing days per month	17
Average number of boats fishing each month	4
Average catch per boat per day of fishing	71 bushels
Weight of one bushel of shellstock	90 pounds
Weight of one gallon of shucked meats	8 pounds
Average yield of meats per bushel of shellstock	1½ gallons or 12 pounds
Average cost of shellstock per bushel	$1.25
Average cost of shucking per gallon of meat	$0.35
Average selling price per gallon of meat	$1.85-$2.50
Average number of gallons shucked per worker per day	32

Chemical analysis (Lee, 1944--see Table 4) and feeding tests (Darling, 1944--see Table 5) indicate that the ocean quahog is nutritious. On a dry weight basis, it is higher in protein and ash than the bay quahog but lower in glycogen. Its

Table 4 - Proximate Analysis of Ocean Quahogs[1/]

Condition	Water	Protein (N x 6.25)	Fat (Petroleum ether extract)	Ash	Difference from 100
	Percent	Percent	Percent	Percent	Percent
Simmered	75.2	18.20	0.26	2.17	4.17
Fresh shucked	82.0	-	-	-	-
Dry basis	-	83.4	1.09	8.73	16.8

1/Analysis made by Charles F. Lee, Chemist, Fishery Technological Laboratory, Division of Commercial Fisheries, College Park, Maryland.

riboflavin content was 266 micrograms per 100 grams of ocean quahog meat. In feeding tests using young rats, a comparison of the proteins of ocean quahogs and beef was made at levels of 11 and 12.5 percent, respectively. The proteins were of equal growth-promoting value. Thus, it can be seen that this shellfish offers a wholesome, nutritious source of food.

Table 5 - Average Gain in Live Weight of White Rats and Protein Intake Per Group for an Eight-Week Period[1/]

Source of Protein	Number of Rats	Av. Gain in live weight	Coefficient of Variation	Average Protein Intake	Standard Error
		Grams	Percent	Grams	Grams
Ocean Quahogs	10	117.3	12.5	55.6	0.12
Beef	4	115.3	9.9	55.3	0.19

1/Data from report by Dorothy B. Darling, formerly Pharmacologist with the Fishery Technological Laboratory, Division of Commercial Fisheries, College Park, Maryland.

There is no reason why the ocean quahog should not be one of the finest shellfish obtainable. Its habitat is clean, deep ocean water and with proper handling it can be made an important addition to the group of edible shellfish. In the section of this report which follows, detailed information is given to indicate the current pitfalls in the methods of handling which detract from its wholesomeness. By eliminating these basic difficulties in the industry, the ocean quahog can be made one of the safest and most wholesome forms of seafood.

PART II

The major difficulty in the ocean quahog industry, as now practiced, is the production of a commodity which can meet the bacteriological standards established for shellfish by the U. S. Public Health Service (1946). The presence of coliform bacteria in commercial packs of ocean quahogs had been reported by the Rhode Island State Health Department and excessively high bacterial counts had been obtained. When consideration was given to the environment of the shellfish, it seemed unreasonable to believe that any coliform bacteria found in the waters or mud from which the ocean quahogs were being taken could have any sanitary significance. It was equally doubtful if any such organisms present in the animal at the time of removal from the sea could be construed as evidence of domestic sewage pollution. For these reasons, a bacteriological investigation was initiated to determine the sources and types of coliform bacteria and to locate the place in handling and processing where large numbers of bacteria were introduced.

The initial investigations began in December 1943. Sampling stations were established in each of three production areas which were then being worked by the dredgers. A station was established at the approximate center of each bed and four satellite stations radiating due north, east, south, and west were established at a distance of one-half mile from the center. These satellite stations were generally located at the approximate edges of the beds. However, in the case of Bed No. 2, the north and south stations had to be established one mile distant from the center in order to be on the periphery of the production area. By this arrangement of five stations at each bed, it was possible to detect any pollution which might be tide or current-borne. Since these areas were located in ocean shipping lanes, it was impossible to use buoys to mark exact locations. Land ranges, compass bearing, and running time were used to locate the stations on sampling trips.

The locations of the sampling stations are given below and are shown on the accompanying map (see Fig. 6, p. 10). (U. S. Coast and Geodetic Chart #1210, Jan. 1944.)

Bed No. 1: This was designated as the Newport Grounds station. The center of the bed (Station No. 1) was located 1.5 miles SW. by S. $\frac{3}{4}$ S. from Brenton Lightship. The satellite stations were each located 0.5 mile from the central one. The water depths ranged from 97 to 102 feet.

Bed No. 2: This bed was SSE. of Point Judith Whistling Buoy. The center of the bed (Station No. 2) was located 2-1/8 miles SSE. of Point Judith Whistling Buoy. Station No. 2a was one mile due north, and Station No. 2b, one mile due south of the central station. The other two satellite stations were 0.5 mile from the central station. The water depths ranged from 80 to 117 feet.

Bed No. 3: This bed was SW. by S. of the west entrance of the Point Judith Breakwater. The center of the bed (Station No. 3) was 3 miles SW. by W. from the west entrance of Point Judith Breakwater. The satellite stations were each located 0.5 mile from the central station. The water depths ranged from 80 to 120 feet.

Two types of investigations were made. The first dealt with the bacteriology of water, mud, quahogs, etc., as separate materials. The results of this work indicated that process studies would be desirable. These were made by making bacteriological tests of the water, mud, and quahogs from the same area and then testing samples of the catch throughout the handling and processing to the final

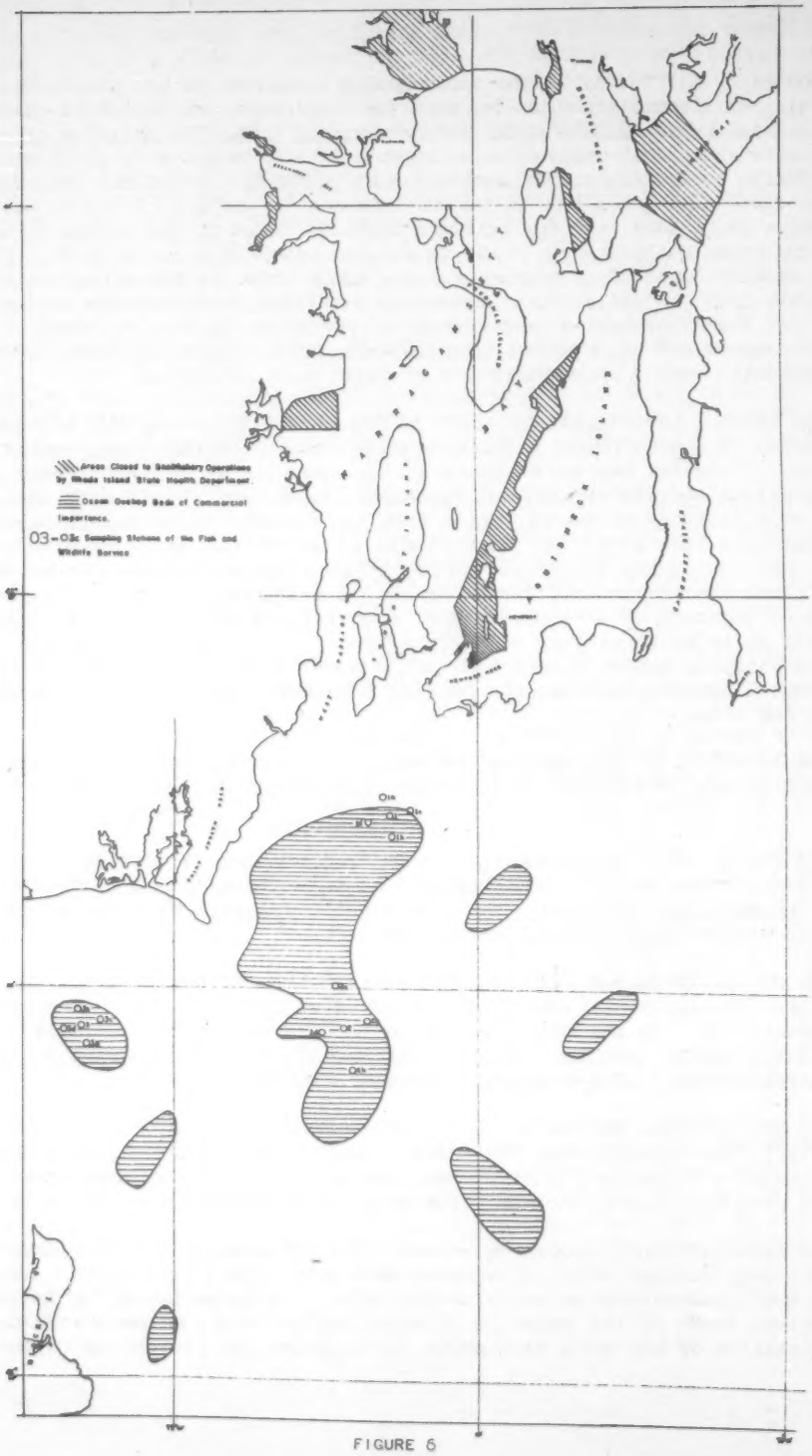
Areas Closed to Shellfishery Operations by Rhode Island State Health Department
Ocean Quahog Beds of Commercial Importance.
03 - Oliver Sampling Stations of the Fish and Wildlife Service

FIGURE 6

consumer product. In all of the work, pertinent, supplementary field data were obtained, such as air and water temperatures, state of tides, etc.

Surface and bottom water samples were collected with a suitable sampling device. Mud samples were obtained from the dredges. Except in the case of the process samples, where separate lots of quahogs were earmarked, quahogs were taken at random from the catch as it was dumped on the deck of the vessel.

Throughout the study, methods given in Standard Methods for the Bacteriological Examination of Shellfish (1944) were employed. Presumptive tests for coliform bacteria were made with lactose broth and these were confirmed with brilliant green lactose bile broth and eosin-methylene blue agar. The plate counts were made with tryptone-glucose agar. Isolates were made from the eosin-methylene blue agar and sent to the Fish and Wildlife Service Laboratory at College Park, Md., for taxonomic studies.

If the presence of coliform bacteria in ocean quahogs represents pollution at the source of the shellfish catch, then the waters of the area should also contain these micro-organisms. This should be particularly true in the case of the bottom water in which the quahog feeds. High total bacterial counts in the ocean quahog might also have their origin in the surrounding waters. One might also expect that the bacterial content of the waters might alter appreciably with the

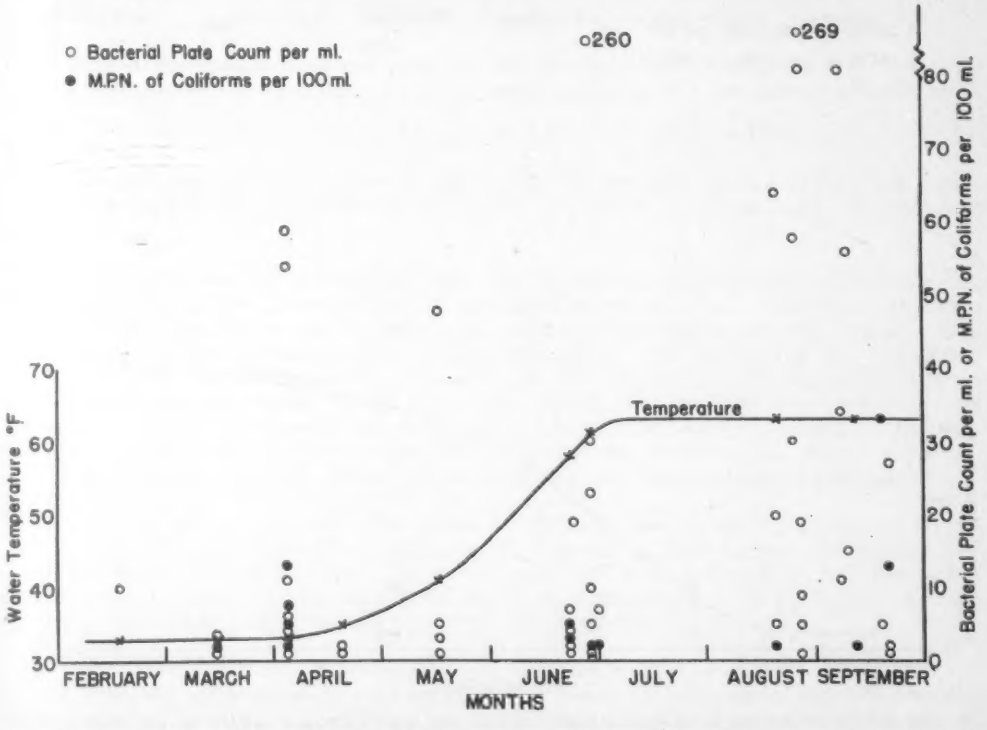

FIGURE 7 - DISTRIBUTION OF STANDARD PLATE COUNTS AND MOST PROBABLE NUMBER OF COLIFORM BACTERIA OF BOTTOM WATER SAMPLES

temperature of the water, higher counts and coliform scores being obtained during the warmer weather. It was necessary, therefore, to make quantitative bacteriological studies of the waters at each station in order to determine the role of the natural environment in regard to the findings with the ocean quahog per se.

In all, 53 samples of bottom water from all three stations were examined during the period of sampling (February through September). The water temperature varied from 35.9° to 63° F. The distribution of the standard plate counts and the coliform scores in relation to the water temperature are shown in Fig. 7, (see p. 11). The average bacterial count per ml. for each respective month was as follows:

February - 2 April - 6.72 May - 10 June - 6.29 August - 55.6 September - 28.4

The average bacterial count per ml. for each station was:

No. 1 - 7.0 No. 2 - 28.0 No. 3 - 50.0

The average Most Probable Number of coliform bacteria per 100 ml. for each month was:

February - 4.7 April - 0 May - 0 June - 7.0 August - 0 September - 0

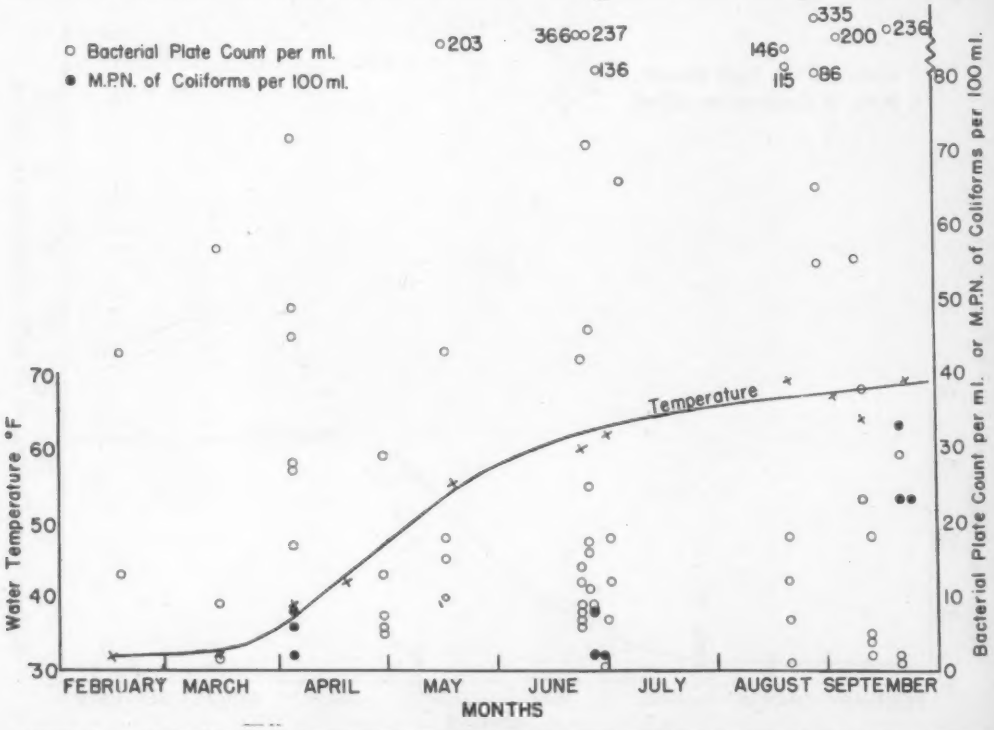

FIGURE 8 - DISTRIBUTION OF STANDARD PLATE COUNTS AND MOST PROBABLE NUMBER OF COLIFORM BACTERIA OF SURFACE WATER SAMPLES

The percent of samples positive for coliform bacteria for each station was:

No. 1 - 38 No. 2 - 5 No. 3 - 6

In the case of Station No. 1, the coliforms were found throughout the sampling period; at the other two stations they occurred only during July.

The bacterial counts on 53 samples of surface waters showed wider variations than those of bottom waters (Fig. 8, see p. 12). The average bacterial plate count per ml. for each respective month was as follows:

February - 28 April - 27 May - 58 June - 61 August - 20 September - 78

In general, these averages are consistently higher than those for bottom water samples. The average bacterial count per ml. for each station was:

No. 1 - 45.8 No. 2 - 64.8 No. 3 - 28.3

In the case of the first two stations, these average counts are considerably higher than in the case of bottom water counts from the same areas.

The average Most Probable Number of coliform bacteria per 100 ml. by month was:

February - 0 April - 2.1 May - 0 June - 2.5 August - 0.2 September - 0.3

This distribution does not parallel the findings with bottom water. The percent of samples from each station which were positive for coliform bacteria was:

No. 1 - 39 No. 2 - 17 No. 3 - 12.5

Most of the positive tests at Station No. 1 occurred during April; the other two stations showed this group of organisms sporadically during June, August, and September.

The difference in results between bottom and surface waters can probably be accounted for by the location of the production areas. All three were situated in main shipping lanes and in addition to the normal ship traffic, these areas were being traversed continually by mine sweepers. The discharge of refuse and sewage from boats and the continual churning of the water probably maintained a relatively high bacterial flora which was diminished by dispersal and dilution before it reached the depths at which the quahogs were taken. Possibly, the high values obtained which made for the wide fluctuations shown in the result were due to samples taken in zones where refuse recently had been dumped overboard.

Mud was tested only for the presence of coliform bacteria, no quantitative bacteriological determinations being made. Fourteen samples were examined over the period of field operations. Of these, only one gave evidence of coliform bacteria being present and in this instance, the presumptive test could not be confirmed. This particular sample was obtained from Station No. 3.

Thirty-two samples of ocean quahogs were collected during the course of the field studies. The average bacterial plate count of the meats was 322 per ml. This is about 12 times as high as the average for the bottom water which was 28 per ml. The plate count average by months was as follows:

February - 165 April - 35 May - 1,214 June - 45 August - 506 September - 371

The average plate counts for each station were distributed as follows:

No. 1 - 125 per ml. No. 2 - 438 per ml. No. 3 - 39 per ml.

The counts varied from a low of 6 per ml. in one sample taken at Station No. 1 in February, to a high of 3,530 per ml. in a single sample taken at Station No. 2 in May.

The Most Probable Number of coliform bacteria per 100 ml. averaged 74 for all samples but only 5 out of the 32 samples yielded positive tests for these organisms. The average Most Probable Number by months was as follows:

February - 22 April - 0 June - 4 August - 303 September - 0

The high score for August was due to a single sample having a Most Probable Number of 2,400 per 100 ml. The average for each respective station was:

No. 1 - 17 No. 2 - 0 No. 3 - 240

Four samples from Station No. 1 were coliform positive; one was positive from No. 3; and none of the samples from No. 2 showed the presence of this organism. The high average Most Probable Number value for Station No. 3 was due to the same high-score sample responsible for the August average.

The average Most Probable Number of coliform bacteria in ocean quahogs was exactly 100 times greater than that of the bottom water which was 0.74 per 100 ml. The percent of ocean quahog samples which were positive for coliform were in agreement with what was found in bottom water, the percent of positives being 16 for the former and 17 for the latter. There was no agreement, however, between the distributions by months or stations. The results probably indicate what the expected frequency of coliform bacteria may be in production areas.

The higher bacterial plate counts and Most Probable Number of coliform bacteria in the shellfish is an expected finding since the ocean quahog undoubtedly concentrates micro-organisms within itself by filtering them out of large quantities of sea water. The data indicate that the bacterial content of the quahog is about 10 to 12 times that of the surrounding water. Should this ratio prove to be correct over a period of several years in various types of producing waters, it would be possible to evaluate the bacterial quality of the shellfish on the basis of data obtained on bottom water samples alone.

From January through September, quantitative tests were run on shellstock taken from the shucking houses. The specimens were treated in exactly the same manner as those taken in the field. In all, 42 composite samples were examined. Of these, 7 had a bacterial content so high that the plates could not be counted, and the plates had to be discarded because of an excessive number of spreading colonies. The average standard plate count of the remaining 34 samples was 3,140,460 bacteria per ml. of quahog meat. This is almost 10,000 times greater than the average value per shellfish taken directly from the water.

The average Most Probable Number of coliform bacteria for the 42 samples was 3,669 per 100 ml. This is over 400 times the average Most Probable Number per 100 ml. for the freshly-caught shellstock. The percent of samples yielding positive tests for coliform bacteria was 40.5, which is over twice the value for the field samples.

There was no correlation between the magnitude of the plate counts or coliform scores and the season of the year, the original source or the shucking plant from which the specimens were taken. The data indicated that either methods of handling or a period of incubation was increasing the bacterial content of the shellstock. Another possibility was that the ocean quahogs were being grossly contaminated from some external source. Whatever the cause, however, it was apparent that from a bacteriological viewpoint, the shellstock was usually of very poor quality by the time it reached the shucker.

Bacteriological determinations on 30 samples of shucked ocean quahog meats examined over the same period of time and from the same plants as the shellstock showed a further increase in both the standard plate count and the coliform content. The plate count increased about one-third over that of the shellstock in the plant, the value for the average being 124,751 per ml. Whereas, only 40.5 percent of the unshucked quahogs in the plants contained coliform bacteria, 83.3 percent of the shucked samples yielded positive tests for this group of bacteria. The average Most Probable Number of coliform in the shucked stock was 7,191 per 100 ml. This is roughly twice as many as were found in the unshucked specimens.

During April 1944, one plant began saving the liquor from the ocean quahogs by shucking into collanders which were placed in pans to catch the juice. Recovered liquor was strained through cheesecloth into a storage tank and after settling, all but the lower few inches was decanted into suitable containers and frozen. This made it possible to obtain bacteriological data on the fresh shell liquor. The average standard plate count for 18 samples was 16,404 bacteria per ml. and the average Most Probable Number of coliform bacteria was 2,174 per 100 ml. Forty-four percent of the samples gave positive tests for this group of organisms.

In considering the possible sources of coliform bacteria which might be responsible for the post-catch contamination, the most obvious source appeared to be the bags in which the shellfish are stored. These were being re-used without being cleaned. The wet bags were dumped in large piles on the floor of the shucking house where they remained for a day or more. When a sufficient number accumulated, the bags were hung out on lines or were spread over shell piles or on the ground where they became contaminated with sea gull droppings. The bags are 18 inches wide and 34 inches long and each bag contained an average of 696,968 coliform bacteria. Ordinary washing failed to reduce this number appreciably but 5 thorough washings with soap and hot water and equally thorough rinsing in clean hot water reduced the average coliform content to 29,364 per bag.

Treatment of the washed, clean bags with a solution containing 100 p.p.m. of free chlorine for 10 minutes failed to eliminate these bacteria. By subjecting the clean bags to live steam for 10 minutes, it was possible to rid them completely of coliform bacteria. This could also be accomplished by commercial laundry practice which was found to be the most satisfactory and least costly method. The elimination of coliform bacteria from cotton or jute fibers is difficult and unless great care is taken to keep the bags clean, and properly sterilized, they offer a serious menace to the bacteriological quality of the shellfish.

A second source of contamination was bilge water. The water from the holds of the ocean quahog dredgers was usually pumped out on the dock where it was permitted to run over the shellstock stored thereon. This bilge water contained on the average of about 16,000 coliform bacteria per 100 ml. The practice of permitting this grossly contaminated water to contact the shellstock can easily be eliminated by the use of overboard bilge pumps.

During and immediately following a spell of extremely hot weather in August, a series of "process" samples were examined bacteriologically. The temperature of the bottom water at this time varied from 51° to 63° F. This period represented a time when one would expect maximum coliform scores and plate counts in field samples. Since the samples were homologous; i.e., taken at the same time from the same source in each sampling series, it was also possible to evaluate bacteriologically, the influence of handling, transportation, and processing.

The technic employed was as follows. A specimen of mud was taken from the dredge at the time of the first haul. Samples of surface and bottom waters were taken before dredging began, after the sixth dredge haul, and after the last haul. Samples of ocean quahogs were taken from the first and last hauls of the dredge, upon arrival at the dock, upon arrival at the shop, after overnight storage at the shop, immediately after shucking, and at the time of packing. Field samples were adequately refrigerated until examined in the laboratory. Specimens from the shop were taken directly to the laboratory and the bacteriological tests were begun immediately. Every effort was made to get the laboratory tests accomplished as soon as possible in order to obtain data which would be representative of the specimens.

The bacteriological findings are summarized in Table 6 (see p. 17). The data indicate that even under conditions of expected high bacterial counts, the mud, water, and ocean quahogs initially are of good sanitary quality. It is not until the shellstock has been out of water for some time that the bacterial count of the ocean quahog increases. From the time of arrival at the dock until the final product is ready for packing, the bacterial content, including the coliforms, increases. In some instances, there was a slight decrease in plate counts after the meats had been washed, but the coliform content usually remained high. One sample of ocean quahogs failed to give any indication of coliform bacteria throughout the entire transportation-processing period, although the plate counts showed some increase.

From these data, it is evident that the bacteriological difficulties originate at the time the ocean quahogs are first stored on the deck of the vessel in bags. From this point on, the problem is aggravated by the methods of transportation and processing. Modifications in the present handling technics are necessary if the excellent quality of the shellstock as it comes from the water is to be maintained until the final product reaches the consumer.

In order to determine the predominant types of coliform bacteria present in each phase of sampling, 223 isolates from confirmatory media were studied taxonomically. Detailed taxonomy was not done but the cultures were classified into 5 types with the idea of designating the probability of their ultimate source, the assumption being made that typical Escherichia members and related form were of fecal origin and that the typical Aerobacter members and related types were of soil, plant, or water origin. Such designations are purely arbitrary and may have no real significance in this particular case.

The coliform group and each of its 5 types were defined as follows: Coliform Group: This included only asporogenuous, Gram negative, aerobic rods which fermented lactose aerogenically within 48 hours.

Type I: All organisms of this type were characteristic Escherichia members. Acetylmethylcarbinol was not produced from dextrose. Citrate was not utilized as a sole source of carbon and cellobiose and alphamethylglucoside were not fermented. Hydrogen sulfide was not formed. Indole was produced. Organisms showing these characteristics were considered to be typical of the fecal coliform bacteria.

Table 6 - Bacteriological Data Obtained on Process Samples

Type of Sample	Time of Sampling	I Aug. 20-21		II Aug. 22-23		III Aug. 25-26		IV Aug. 27-28		V Aug. 29-30	
		M.P.N. Coliform per 100 ml.	Standard plate count per ml.	M.P.N. Coliform per 100 ml.	Standard plate count per ml.	M.P.N. Coliform per 100 ml.	Standard plate count per ml.	M.P.N. Coliform per 100 ml.	Standard plate count per ml.	M.P.N. Coliform per 100 ml.	Standard plate count per ml.
Mud	First haul	0	*	0	*	0	*	0	*	0	*
Surface water	Before dredging	0	18	0	7	0	115	0	86	0	200
Bottom water	Before dredging	2	5	*	*	0	30	0	9	0	19
Surface water	After sixth haul	0	2	*	*	0	146	0	65	0	55
Bottom water	After sixth haul	0	10	*	*	58	5	0	5	0	91
Surface water	Last haul	0	12	*	*	0	0	0	338	0	*
Bottom water	Last haul	0	64	*	*	0	1	0	1	0	*
Quahogs	First haul	0	265	0	232	0	3,100	2,400	1,080	0	800
Quahogs	Last haul	20	117	0	280	0	1,720	0	1,300	0	760
Quahogs	Arrival on dock	*	*	45	3,540	9,200	572,000	0	1,560	490	T.N.C.
Quahogs	Arrival on dock	20	*	1,400	3,280	16,000	299,000	0	640	2,400	1,560,000
Quahogs	Shop - next morning	0	16,260	16,000	76,000	16,000	306,000	0	11,400	16,000	110,000
Quahogs	Freshly shucked	13,000	338,000	16,000	430,000	16,000	106,000	0	7,000	16,000	188,000
Quahogs	Washed meats	*	*	16,000	566,000	16,000	540,000	0	4,400	3,500	61,800
		VI Sept. 9-10		VII Sept. 11-12		VIII Sept. 18-19		IX Sept. 21-22			
Mud	First haul	0	*	0	*	0	*	0	*		
Surface water	Before dredging	0	23	0	18	0	2	23	5		
Bottom water	Before dredging	0	81	2	15	*	*	13	27		
Surface water	After sixth haul	*	55	0	5	0	29	23	5		
Bottom water	After sixth haul	0	269	0	34	0	5	0	2		
Surface water	Last haul	0	37	0	4	33	236	0	5		
Bottom water	Last haul	0	11	0	56	33	*	0	1		
Quahogs	First haul	0	130	0	640	0	1,200	*	*		
Quahogs	Last haul	0	138	0	820	0	1,520	*	*		
Quahogs	Arrival on dock	170	6,600	5,400	T.N.C.	490	*	*	*		
Quahogs	Arrival on dock	220	760	3,500	6,400	790	*	*	*		
Quahogs	Shop - next morning	490	7,400	2,400	124,000	1,300	508,000	*	*		
Quahogs	Freshly shucked	5,400	78,000	5,400	152,000	790	310,000	*	*		
Quahogs	Washed meats	330	20,000	16,000	72,000	16,000	23,400	*	*		

*No test made

T.N.C. - Too numerous to count

Type II: Cultures of this type belonged in the group of Escherichia-Aerobacter intermediates. They had the same general characteristics of Type I but were irregular regarding either citrate utilization or the fermentation of cellobiose and alphamethylglucoside or else they produced hydrogen sulfide. All cultures of this type produced indole. They were considered as being probably of fecal origin.

Type III: The cultures of this group were characteristically Aerobacter cloacae types. They produced acetylmethylcarbinol from dextrose, fermented cellobiose and alphamethylglucoside, and utilized citrate. They were non-encapsulated and produced flat, gray colonies on eosin-methylene blue agar. The possibility that such cultures might be of fecal origin was considered.

Type IV: These organisms possessed the same characteristics as Type I but were atypical in colonial appearance on eosin-methylene blue agar and failed to produce indole. These were classified as atypical Escherichia members, probably not of fecal origin.

Type V: This group was composed of typical Aerobacter members. They all produced acetylmethylcarbinol from dextrose, were active fermenters of cellobiose and alphamethylglucoside and utilized citrate as a sole source of carbon. They were hydrogen sulfide negative. The organisms were all encapsulated and produced raised, mucoid colonies on eosin-methylene blue agar. They were indole negative. Most of them were Aerobacter oxytocum except for this last characteristic. All cultures of this type were considered to be non-fecal in origin.

The distribution of the various coliform types is indicated in Table 7. Characteristic fecal Escherichia cultures (Type I) occurred the least frequently, only

Table 7 - Types of Coliform Bacteria Isolated From Various Sources

Type of Sample	TYPE OF COLIFORM BACTERIA 1/ Cultures Isolated				
	I	II	III	IV	V
	Number	Number	Number	Number	Number
Mud	2	0	2	0	0
Bottom Water	7	5	5	2	4
Surface Water	8	5	5	2	4
Ocean Quahogs (from water)	3	10	6	5	5
Ocean Quahogs (at shop)	0	15	13	14	13
Ocean Quahogs (meats)	6	20	8	19	8
Ocean Quahog Liquor	0	1	3	6	3
Bags	1	3	3	1	4
Bilge Water	1	0	1	0	0
Total Cultures	28	59	46	48	42
Percent of Total	12.5	26.0	21.0	21.5	19.0

1/Coliform bacteria were classified as follows:
Type I: Typical Escherichia
Type II: Escherichia - Aerobacter Intermediates
Type III: Aerobacter cloacae
Type V: Typical Aerobacter

12.5 percent being of this type. The other four types were about equally divided, the respective percent of each being as follows:

Type II - 26 Type III - 21 Type IV - 21.5 Type V - 19

Since there was practically no opportunity for either the water or the ocean quahogs to be initially contaminated from any sewage source except the water traffic in the production areas, it may be that the only coliform bacteria of any sanitary

significance were those of Type I. The largest single source of the typical Escherichia members was the water (surface and bottom), 15 of the 28 cultures having come from this source. The other four types were predominantly from ocean quahogs. In the case of Type II cultures, 45 out of 59 were from ocean quahogs, with 30 of the 45 coming from the stored shellstock and shucked meats. Of the Type II cultures, 27 out of 46 were from the shellstock but the largest single source (13 cultures) was the stored shellstock. The same general picture also characterizes the other two types, 38 out of 48 Type IV cultures coming from the ocean quahogs and 26 out of 42 Type V cultures having the same origin. The outstanding single source of Type IV cultures was shucked meats and of Type V, the stored shellstock. The low incidence of Type I organisms in the ocean quahog would seem to indicate that most of the coliform bacteria found may not have been of fecal origin at all but represented strains of bacteria which are indigenous to the shellfish and which had had an opportunity to multiply. While admitting the undesirability of coliform bacteria in the final product, there is a reasonable doubt regarding the sanitary significance of their presence in the materials examined in this investigation. True fecal pollution during storage and shucking would probably yield a much higher percentage of typical Escherichia coli.

Recommended Practices

The bacteriological data presented in this study leaves little doubt concerning the necessity of modifying current trade practices if the initial high quality of the ocean quahog is to be maintained until the final product reaches the consumer. It should be neither too costly nor too troublesome to produce a seafood of excellence from this shellfish. With the aim of accomplishing this, the following practices are recommended:

1. Bags: The bags used for storing the shellstock should not be re-used without having been laundered. They should be stored in such a manner as to prevent exposure to external contamination.

2. Aboard the Vessel: The bagged catch should be protected from direct exposure to the sun and heat. Preferably, the shellstock should be thoroughly iced as soon as possible after removal from the water.

   The ocean quahogs should be stored in a manner which will protect them from exposure to bilge water or other sources of contamination.

   Upon return to port, the ocean quahogs should be re-iced, if necessary, or transferred to a refrigerator. If further hauling is necessary, they should be transferred immediately to a pre-cooled truck or other vehicle. Shellstock should not be permitted to stand unprotected for any length of time on the dock or on the deck of the vessel.

3. Transportation: The trucks used for transporting shellstock should be designed to prevent contamination of the ocean quahogs from dust and dirt. The trucks should be pre-cooled before loading and the load should be thoroughly iced. Upon arrival at the plant the load should be re-iced, if necessary, if it is not removed immediately.

4. Storage: Throughout the period of storage, the ocean quahogs should be kept at a temperature not higher than 40° F. It is recommended that the shellstock be held no longer than 24 hours before shucking and that 48 hours should be the maximum period of storage for the shellstock.

5. Shucking Room: Shucking room cleanliness is essential for the production of high quality food. At the end of each day, the benches should be cleared of all materials and utensils and thoroughly cleaned. The floors should

be swept and scrubbed daily. Platforms upon which the shuckers stand should never be placed on the shucking benches. They should be stood on end on the floor, thoroughly washed and left in this position until used again.

Shellstock should not be washed free of mud on the benches while shucking is in progress. It would be desirable to have a separate bench for this purpose and to have only clean quahogs on the shucking benches.

6. Utensils: All shucking knives, buckets, and other utensils should be thoroughly cleaned at the end of each day's operations and should be sterilized in accordance with the recommendations of the State health authorities. Only utensils which are in good repair and which are free of rust or other corrosion should be employed.

7. Packing Rooms: The packing room should be immaculately clean at all times. The equipment should be sterilized by the use of suitable antiseptic agents. The receptacles into which the ocean quahogs are packed must be kept free of dirt and stored in a manner which will keep contamination at a minimum. In the case of metal containers, a rinse with chlorine solution prior to packing will effectively eliminate contamination from dust and handling. The lids should be similarly treated. Under no circumstances should the packer's hands come in direct contact with the inside of the containers.

8. Storage of Packaged Meats: As soon as the ocean quahogs are packaged they should be refrigerated. The lag between the packaging and refrigeration should not exceed 30 minutes at any time. When friction-top metal cans are used, care should be taken to prevent over-filling so that the lids will not be forced off during refrigeration. Any lids which do come off during storage should be replaced with new, clean ones and the originals returned to the packing room for cleaning and sterilization before they are re-used.

9. Shipment: Ocean quahogs must be kept at a temperature not exceeding 40° F. at all times until used. Shipments must be kept properly refrigerated throughout the period of transit. This applies to shellstock as well as shucked meats.

10. Personnel: All workers should remove their aprons, rubber gloves, etc., before entering the toilet and should wash their hands thoroughly with soap and water before resuming work.

Shuckers should not enter the packing room at any time.

Lunches, overcoats, and other personal property should be stored elsewhere than in the shucking or packing room. If winter outer-clothing is necessary for persons working in the freezers, this should be special clothing and used only for this purpose and it should be kept clean and in good repair.

The above suggestions are supplementary to any requirements of the U. S. Public Health Service, the U. S. Food and Drug Administration, the State regulatory authority, or local food agency. These recommendations are based upon observations of the ocean quahog operations and indicate methods of eliminating some of the chief obstacles in the way of maintaining high quality production. The ocean quahog offers a food source of very high quality; it is ridiculous to sacrifice the quality through failure to follow these relatively simple and inexpensive practices.

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The illustrations appearing in this report are taken for the most part from the previous joint publication (1945) of the Fish and Wildlife Service and the Rhode Island Division of Fish and Game. Mr. George Glen, formerly of the Fish and Wildlife Service, Division of Fishery Biology, made the drawings of the shell in Figure 1; Mr. Walter Rust prepared the drawing of the dredge; and the maps were drawn by Mr. Charles Lee. Mr. Rust was formerly on the staff of the Fisheries Technological Laboratory at College Park, Maryland; Mr. Lee is still a staff member of the Laboratory.

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PRELIMINARY STUDY OF CORRELATION OF pH AND QUALITY OF SHUCKED PACIFIC OYSTERS

By Frank T. Piskur*

ABSTRACT

Stored shucked Pacific oysters decreased in pH from 6.4 to 6.0 as quality changed from fresh to fair. A pH of 5.9 or less indicated that oysters were inedible.

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In order to obtain a chemical index for the quality or freshness of commercially shucked Pacific Coast oysters, a preliminary study was made to determine the possible application of pH measurements. Work of this nature had already been conducted by Hunter and Linden[1/] who found a definite relationship between the pH of the liquor from Atlantic Coast oysters and their freshness. The hydrogen ion concentration or pH of the oyster liquor increased during the process of spoilage regardless of the temperature of storage or bacterial count. The authors, using Potomac River oysters, found that from a pH 6.1 to 5.6 the oysters changed from good to stale in quality; from pH 5.3 to 4.9 from stale to sour or putrid; and at less than pH 5.0 the oysters were in an advanced stage of putrefaction.

Baldwin, Puncochar, and Pottinger,[2/] some years later, repeated some of these studies. Their tests were made with the ground oyster meats as well as the oyster liquor. The original pH of the liquor was higher than that for the oyster meats; however, near the end of the storage period these values tended to be equal. They found, using East Coast oysters, that: at pH 6.2 to 5.9 oysters were in a good condition, at pH 5.8 in an "off" condition, pH 5.7 to 5.5 in musty condition, and pH 5.2 and lower the oysters were sour.

In the following preliminary work with Pacific oysters, an attempt was made to determine whether or not a set of pH standards could be prepared for these oysters and to determine if any correlation exists with the results of work with East Coast oysters.

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1/Hunter, A. C. and Linden, B. R. The Investigation of Oyster Spoilage, American Food Journal 18, No. 519, 537-8 (1933).

2/Baldwin, W. H.; Puncochar, J. F.; and Pottinger, S. R. Some Preliminary Studies on the Relative Value of Methods for Indicating Quality of Shucked Oysters. U. S. Fish and Wildlife Service Bulletin F.I. 2468-K.

Experimental Procedure

These tests were conducted in the field at a West Coast shellfish packing plant, using the facilities of the Fish and Wildlife Service mobile laboratory. The oysters were obtained directly from the packing line and represent "run of the mill" samples as no attempt was made to separate the various grades. These oysters, therefore, had received the usual commercial shucking, washing, and blowing.

After the initial pH measurements had been made, the oysters were repacked in one-half pint waxed ice cream cartons and placed in storage at 32° to 34° F. Organoleptic observations for odor and flavor and pH tests were made at periodic intervals during storage.

For the pH determination, three or four oysters were ground in a Waring Blendor and warmed to room temperature by alternately grinding the sample and warming the Blendor in a water bath to insure a thoroughly ground sample at the same uniform temperature. The pH determination was made on this ground sample using a Beckman model G pH meter. Three separate determinations were made for each test.

Preliminary tests in which the pH values of the surface, interior, and the ground oysters were studied, indicated that a more uniform sample and more uniform results were possible throughuse of the ground oyster samples at room temperature.

Discussion

Organoleptic observations and pH tests were made with two separate lots of oysters. The results are summarized in Table 1.

Table 1 - Comparison of pH Determinations and Organoleptic Examinations of Shucked Oysters Stored at 32°-34° F.

SERIES I			SERIES II		
Days Stored	Average pH	Condition of Oysters	Days Stored	Average pH	Condition of Oysters
0	6.39	Fresh	0	6.39	Fresh
2	6.27	Good	2	6.08	Good
6	6.14	Slightly strong, but good	4	6.03	Fair
			6	6.01	Slightly stale, but edible
9	5.93	Fair, but edible			
11	5.87	Stale	8	5.88	Stale and almost inedible
13	5.92	Very stale, and almost inedible	10	5.90	Stale and inedible
15	5.89	Slightly putrid and inedible	13	5.74	Very stale
			15	5.75	Slightly putrid
17	5.73	Putrid	17	5.69	" "
20	5.83	"	19	5.80	Putrid
22	5.73	"	21	5.60	"
24	5.66	"	23	5.58	"
26	5.85	"	24	5.70	"
28	5.63	"			
30	5.55	"			

The original pH value of the oysters may show some variation. For example, the pH of the original sample in Series I varied from 6.42 to 6.36 and in Series II from 6.48 to 6.30. Results in the Table represent the average of three or four individual tests.

The pH of the original samples averaged 6.39. The value decreased as storage continued to a pH of 6.0 at which point the oysters were considered to be in only

fair, but edible, condition. At pH 5.90 the oysters were considered stale and proceeded to the putrid stage at about this same value. Below pH 5.90 the oysters continued on to advanced stages of putrefaction. After the oysters had become stale, the pH values tended to vary considerably from sample to sample and from day to day.

From these very limited data, the following values were derived showing the pH ranges for the various organoleptic observations:

From pH 6.4 to 6.0 the oysters changed from a fresh to a fair but edible condition

pH 6.0 to 5.9 from stale to slightly putrid

pH 5.9 and lower from slightly putrid to advanced stages of putrefaction

The development of an objective test to indicate the quality of shucked oysters is important. Packing plants could make freshness tests on oysters as received at the plant and the future keeping quality of each lot could then be determined. Oysters of limited keeping quality would be used only for local consumption; the others for markets at points a greater distance from the packing plants. Buyers could determine the freshness of oysters as received at distant markets. Of particular value would be the use by the Army Quartermaster Corps. Specifications could be set up for purchasing oysters. Organoleptic observations could be supplemented with chemical tests for freshness, allowing for a more suitable basis for examination of quality of fresh oysters.

The results in Table 1 indicate that pH measurements may possibly serve as an objective index of the quality of commercially shucked Pacific oysters. Obviously, however, many phases of the problem, other than those briefly discussed here, are yet to be considered. These include:

1. A more thorough study on the value of the pH of surface and liquor
2. More detailed study of the pH changes on storage
3. Effect of washing and blowing of the oysters
4. Variation in pH from oyster to oyster
5. Variation in pH of oysters from one part of a bed to another, from bed to bed, and from season to season

TECHNOLOGICAL RESEARCH IN SERVICE LABORATORIES

APRIL 1947

Mayaguez, P. R.

Considerable data were made available to the Insular Government on the importance of a fairly extensive fresh-water fisheries project for Puerto Rico.

* * *

Additional data were also obtained for the economic survey of fisheries in Puerto Rico.

FISHERMAN'S HUT, PUERTO RICO

Boston, Mass.

Tests were made to determine the possible contamination of fish fillets by bacteria in fillet washing and brining tanks. The results indicate that the washing and brining tank of a fish filleting line must be considered a serious potential source of contamination of fillets, unless steps are taken for continuous removal of debris, and maintenance of a brine with sufficiently high chlorine content to eliminate the bacteria.

* * *

Several new gallic acid derivatives were made which should be of value as antioxidants for fats.

* * *

Considerable work was done on methods for the elimination of sardines infected with pepper spot (Ichthyosporidium hoferi) prior to canning. Methods based on the use of ultraviolet light to identify lesions, and the use of different concentrations of brine to separate the infected fish were not successful.

College Park, Md.

A number of comparable air-borne and rail express shipments of fish were made from ports in Florida to College Park. Extensive data were collected on duration of trips, temperature of fish, and results of organoleptic tests. A complete report covering these results is in the course of preparation.

* * *

Regular monthly examinations were made of packages in frozen storage. There have been negligible changes in weight of packages of frozen fillets of sea trout and mackerel, except for samples wrapped in locker paper. The fillets so wrapped have shown extensive loss in weight and considerable "freezer-burn."

* * *

Considerable time was spent in kitchen testing recipes for oysters, smoked pollock, and canned silver hake. A bulletin on oyster cookery is being prepared.

* * *

A series of canned fish spreads have been prepared, which should be suitable for use on sandwiches in school lunches.

* * *

Considerable work is being done on testing for the presence of enteric pathogens in materials from several different sources.

* * *

Seventy-four samples of clam extract received from Ketchikan were bio-assayed for toxicity.

Ketchikan, Alaska

Surveys were conducted to determine the clam population of the east coast of Prince of Wales Island. The Kasaan Bay region has fairly large quantities of butter and Little Neck clams. Studies were continued to determine the toxicity of clams from various areas.

* * *

Fair amounts of shrimp were taken in traps in Carroll Inlet, but the bottom is probably too rough for trawling.

* * *

A pack of processed salmon cannery trimmings was examined after seven months of storage. The processed viscera and livers were spoiled. The milt packed in plain cans was spoiled, but that packed in "C" enamel cans was unaffected.

* * *

A number of experimental products prepared at the Laboratory and by Alaskan firms were given organoleptic tests. The samples included fish puddings, smoked eulachons, canned late run herring, and sea cucumbers. The tests indicate these products were of high quality.

Seattle, Wash.

Experiments on frozen storage of Alaskan crab meat were continued. Tanner crab meat, like meat from Dungeness crab, does not store well. The meat from king crab was somewhat tougher, but still in good marketable condition after five months of storage.

* * *

Laboratory investigations were begun to determine methods for analyzing fish livers with a low oil content. The methods now in use are not satisfactory.

* * *

Several compounds were found for use with NDGA which were more satisfactory than citric acid as antioxidants. Phosphoric acid, although a good synergist, had the disadvantage of darkening the color of the oil.

* * *

Additional data were collected on the use of pH as an index of freshness of oysters.

* * *

Experiments were carried out to split fillets with a new commercial fish-skinning machine. Split fillets are more uniform in thickness, and may be more suitable for large scale cooking and serving.

NET DAMAGE INSPECTION

The first step in repairing damage to a net is to determine the type and the extent of the damage, so that the best mending procedure can be decided upon. The proper procedure allows the mender to restore the meshes by weaving in an uninterrupted sequence. The next step is to determine the trimming necessary. To do this, the damaged section of the net is stretched so that the strands line up easily. This is referred to as "straight twine" (Figure 5).

FIGURE 5
STRAIGHT TWINE

FIGURE 6
CROSSTWINE

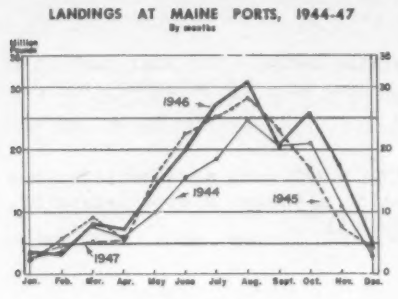
The wrong way to stretch netting is known as "crosstwine" (Figure 6). Note how the strands tend to loop.

--Fishery Leaflet 241

FRESH AND FROZEN FISH

New England

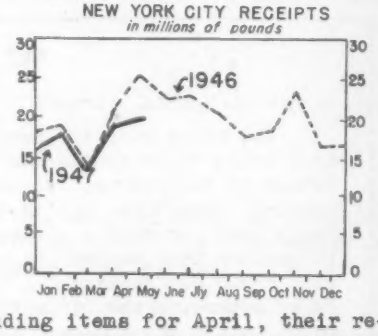
MAINE LANDINGS: Maine fishermen landed 5,646,000 pounds of fishery products, valued at $603,932 during April, bringing the total for the first four months to 19,305,000 pounds, valued at $2,146,844, according to Current Fishery Statistics No. 349. Nearly half the catch in April consisted of rosefish; however, this species ranked third in value, since fishermen received $260,425 for their catch of lobsters, and $179,045 for the soft clams dug during the month, compared with only $62,015 received for the catch of rosefish. The catch by otter trawls accounted for over 60 percent of the fishery products taken during April. Hoes were used in taking 828,000 pounds of shellfish and 615,000 pounds of lobsters and crabs were taken by pots.



During April, landings at Portland amounted to 2,820,000 pounds, valued at $72,203.

Middle Atlantic

NEW YORK CITY ARRIVALS: Landings and receipts of fish and shellfish in New York City during April totaled 19,483,000 pounds. This was an increase of 9 percent compared with March and 19 percent below April 1946, according to the Service's local Market News Office. Compared with the previous month, fish receipts increased over 2,400,000 pounds, while those of shellfish increased 200,000 pounds.



The predominating species during the month were: cod, mackerel, flounder, shad, yellowtail, haddock, and scup. Hard clams, lobsters, oysters, scallops, and shrimp were the leading shellfish items.

While shad and mackerel were among the leading items for April, their respective totals were considerably less than the totals for the same month last year. Shad declined over 900,000 pounds. Despite the early catches of mackerel this year, the total receipts of that species for April were 450,000 pounds less than those of April 1946.

The market throughout the month was never any better than moderate, except for an occasional day when the demand was brisk, but even on those days the market was not sold out.

Chesapeake

PRODUCTION: Production of fish in the Hampton Roads area of Virginia decreased from 5,185,000 pounds during March to 4,480,000 pounds in April, or 7 percent, according to the Service's Market News Office in Hampton. During April 1946, the production was 2,901,000 pounds. Of the total production, 2,354,000 pounds, or 49 percent, were croaker. Scup, with 981,000 pounds, and alewives, with 779,000 pounds came second and third, respectively. About two-thirds of the total catch was made up of trawler fish caught offshore. Landings of fish in the other areas of Virginia, Maryland, and North Carolina covered by the report were larger during April than for many months. This was especially true with respect to the Lower Northern Neck area of Virginia.

Production of fresh picked crab meat increased materially over that for the month of March. One hundred fifty-four thousand pounds were produced, an increase in all areas of 56,000 pounds, or 56 percent. This large increase was caused by the fact that as soon as the weather began to get warm, the crabs started to move around and dredging operations gave way to the use of crab pots. Crab meat production during April 1946 was 98,000 pounds, 36 percent less than for April 1947.

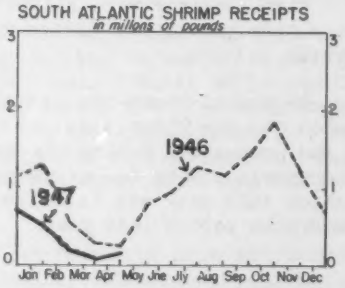
Shucked oyster production dropped from 247,000 gallons in March to 72,000 gallons in April. For the same period in 1946, the production was 69,000 gallons. This big decrease was to be expected owing to the change in seasons.

The demand for fish was fairly good through the month. The good prices received for crab meat during the first half of the month dropped sharply during the latter part of the month. Also, the price of crabs to the fishermen dropped from $15 to $5 per barrel.

South Atlantic

SHRIMP PRODUCTION: Shrimp production in Florida and the South Atlantic States during April amounted to 122,000 pounds (heads off), 9,000 pounds, or 7 percent, more than last month, but 54 percent (145,000 pounds) less than landings in April 1946, according to the Fishery Market News Office in Jacksonville, Fla.

Florida landings were 101,000 pounds against 159,000 pounds for the same period last year--a decrease of 36 percent, while Georgia landings were 80 percent less than in April 1946.



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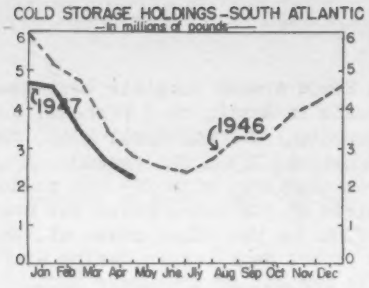
COLD STORAGE: Holdings of frozen fish and shellfish for the five major cold-storage warehouses in the South Atlantic States totaled 2,265,000 pounds on May 1, according to the Service's Market News Office in Jacksonville, Fla. Compared with holdings on April 1 of 2,706,000 pounds, this month showed a decrease of 441,000 pounds, or 16 percent, and was 564,000 pounds less than on May 1, 1946.

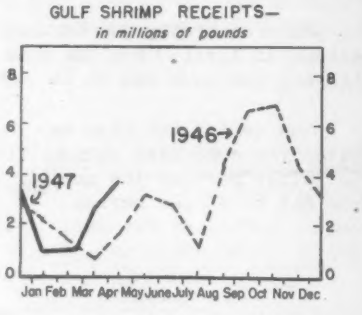


Items with stocks of 100,000 pounds or more were, in order of quantity, as follows: mullet, shrimp, Spanish mackerel, whiting and king whiting, and fillets of cod and rosefish.

Holdings of fish decreased 308,000,000 pounds and shellfish stocks went down 133,000 pounds during April. Large withdrawals of shrimp, mullet, scup, whiting and king whiting accounted for the major reduction. However, there were some gains in the holdings of croaker, grouper, kingfish (king mackerel), and Spanish mackerel.

Gulf

PRODUCTION: Shrimp landings during April for Alabama, Mississippi, Louisiana, and Texas, as reported to the Fishery Market News Office at New Orleans, was 36 percent greater than the previous month and 9 percent greater than April 1946. From January through April 1947, production was approximately 14 percent less than during the corresponding period last year. Up to the end of April this year, Alabama and Mississippi landings were less than during the same period last year, and Louisiana and Texas production was greater.



Oyster production during April compares favorably with landings during the previous month. From January through April, landings this year were 44 percent greater than for the same period in 1946.

Fish landings were slightly greater in April than during last month; salt-water fish production decreased, while landings of fresh-water varieties were greater.

Beginning about the middle of April, appreciable quantities of crabs were landed for the first time this year; however, landings were less than one-half of the production during the same month last year. Crab meat production was low in comparison with former years. Both fresh-cooked and processed crab meat production this year was less than one-half of the quantities produced during the comparable period last year.

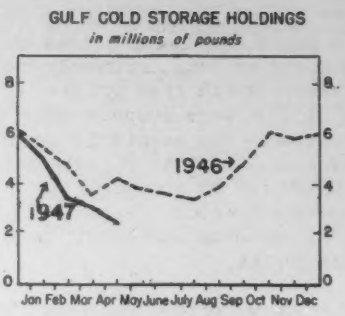
* * * * *

COLD STORAGE: Eleven cold-storage warehouses in Alabama, Mississippi, Louisiana, and Texas reported frozen fish and shellfish holdings of 2,204,000 pounds on May 1, 1947, 16 percent less than four weeks before, and 46 percent less than total holdings on May 2, 1946, according to the Service's New Orleans Market News Office.

Frozen shrimp holdings on May 1 amounted to 799,000 pounds. During the previous four weeks, withdrawals from cold-storage warehouses exceeded the "in" move-

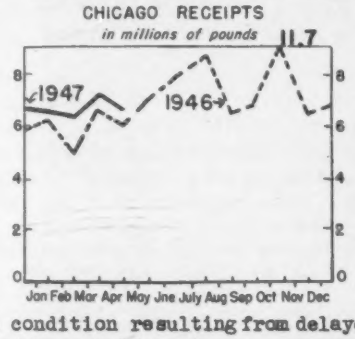
ment by 328,000 pounds. Holdings were 906,000 pounds less than last year.

Salt-water fish holdings on May 1 amounted to 1,128,000 pounds, 124,000 pounds less than four weeks before, and 1,091,000 pounds less than last year. During the past four weeks, the "in" movement of Spanish mackerel exceeded withdrawals by nearly 100,000 pounds. This "in" movement was more than counterbalanced by a large withdrawal of mullet, rosefish and haddock fillets, and nominal quantities of some other varieties.



Great Lakes

RECEIPTS: Receipts of fresh and frozen fishery products in the Chicago wholesale market during April amounted to 6,590,000 pounds, according to the Service's Market News Office in that city. This was a decline of 9 percent compared with March and was 11 percent above April 1946.



Fresh-water receipts declined 9 percent and salt-water arrivals fell 4 percent below March totals. Light production in some of the important fishing areas together with the usual after-Lent let-down in demand accounted, for the most part, for the drop in receipts in the fresh-water section. Salt-water receipts, although 4 percent below those of the previous month, were 121 percent greater than the comparable month in 1946, a condition resulting from delayed arrivals of halibut and salmon from Alaska which had been held up due to transportation difficulties.

Shellfish receipts were 20 percent below those of March but were 71 percent greater than in April 1946. Chief reasons for the decline in shellfish receipts were the sharp drop in arrivals of shucked oysters and spiny lobster tails together with a 9 percent decline in shrimp arrivals. Fresh shrimp from the Gulf States, after a two-month period of light deliveries, made its appearance toward the latter part of the month, when approximately 100,000 pounds arrived within 4 days. Arrivals of Mexican shrimp, an important item during the early months of the year, were missing entirely during April.

Although falling far below 1946 deliveries, fish from Lake Erie and the Bayport, Michigan areas made their appearance during April. Deliveries up to the end of April were little more than half as heavy as in 1946.

Smelt receipts, chiefly from Wisconsin, but with important arrivals added from Michigan, were more than double those of April 1946. Deliveries during the early days of the month found smelt commanding prices of from 25 to 32 cents per pound, but heavy deliveries during the last week in April forced the price as low as 5 cents per pound.

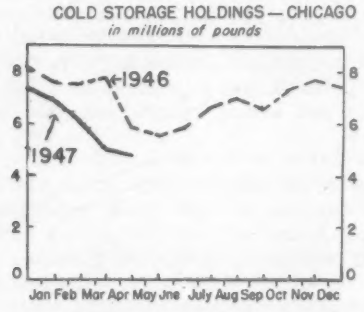
After the consistently high fish prices maintained during the Lenten season, the rapid decline of prices during the remainder of April made selling conditions, in quantity lots, extremely hazardous. This was especially true of the rough fish market. Rough fish prices declined so rapidly and so low that large amounts of No. 1 fish were dumped--some of it directly upon receipt from the producer--so great were the unsalable supplies on hand. Toward the end of April, Lake Erie sheepshead went to 2 cents per pound with no purchasers. Lake Erie yellow pike started out at around 55 cents per pound but fell to 18 cents. Whitefish took perhaps the greatest drop of any item, falling from a high of 68 cents on April 9 to 21 cents on April 30. Lake trout fell from 68 cents to 30 cents during the same period.

Shrimp prices remained fairly steady throughout April, fresh shrimp in the jumbo size, when it was actually jumbo, sold for an average of 80 cents per pound. Frozen shrimp sold from 78 to 83 cents for jumbo, 70 to 75 cents for large, and 55 to 60 cents for medium.

After the Lenten season, the over-all demand for fishery products was erratic and unsustained. One day's demand was entirely different from the following day or the day before. Although prices were as low as the market has offered since 1941, few buyers took advantage of the situation and as a result, instead of truckloads, boxes and half-boxes were sold. However, the market seemed to strengthen somewhat during the last four days of the month.

* * * * *

COLD STORAGE: Stocks of fishery products in Chicago cold-storage warehouses on May 1, 1947, amounted to 4,631,000 pounds, according to the Chicago Fishery Market News Office. This represented a decline of 8 percent compared with holdings on April 3 and was 20 percent below the total holdings on May 2, 1946.



Holdings of fresh-water species declined 2 percent from the total on April 3 and were 42 percent below the total holdings of fresh-water items on May 2, 1946. Chiefly responsible for the decline were greatly reduced holdings of chubs, lake trout, whitefish, and yellow pike. There were reduced holdings of nearly all fresh-water varieties with the exception of catfish, bullheads, and lake herring.

Salt-water holdings declined 5 percent from April 3, but were 2 percent greater than the holdings in this section on May 2, 1946. Although stocks of frozen fillets were 34 percent below the April 3 total, they were also 7 percent below holdings of this item on May 2, 1946. It is noted that on May 2, 1946, cod fillets formed 77 percent of all fillet holdings, while on May 1, 1947, this item formed but 39 percent of the fillet total, being surpassed by rosefish fillets which accounted for 57 percent of the total of frozen fillets. The bulk of the frozen fillets received during April was not stored in warehouses but was, for the most part, sold directly from the dealers' places of business.

Stocks of halibut on May 1 were 2 percent above those on April 3, but much of the halibut received during the month was sold direct without being stored in

cold-storage warehouses, which accounts for the slight variation in holdings of halibut for the month.

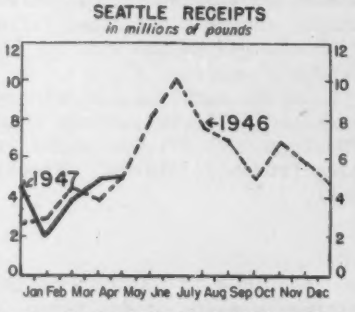
Receipts of halibut during the month were higher than comparable months during years past. This was accounted for by transportation difficulties on the west coast which delayed usual shipments of frozen stocks from Alaska.

Holdings of all varieties of salmon, chiefly fall salmon, were 24 percent above the April 3 total and were 168 percent above holdings of salmon on May 2, 1946. What was true of halibut receipts was also true of salmon as most of the receipts originated in Alaska.

Holdings of shellfish and related products declined 30 percent from April 3 and were 26 percent below holdings on May 2, 1946. During the month, the greatest decline occurred in shrimp holdings as arrivals of this item were seasonally low. Nearly all items in the shellfish section fell below the previous month's holdings with the exception of scallops. Most arrivals of frozen shrimp went directly to the dealers' floors and were sold from there without going to storage.

Pacific

ARRIVALS: Landings and receipts of fishery products at Seattle during April rose to 4,828,000 pounds, according to the Service's local Market News Office. This was about 12 percent over March receipts and 13 percent more than April 1946.



Receipts of fresh salmon, mostly kings, amounted to 642,000 pounds, nearly six times the volume for the previous month and were largely responsible for April's over-all gain. Mild fishing weather and early offshore migrations resulted in better than average troll catches which included 88 troll vessels landing directly at Seattle. Additional deliveries of frozen salmon from Alaskan and British Columbian sources raised the total to slightly more than 2,081,000 pounds. These salmon receipts accounted for nearly 43 percent of Seattle's total volume.

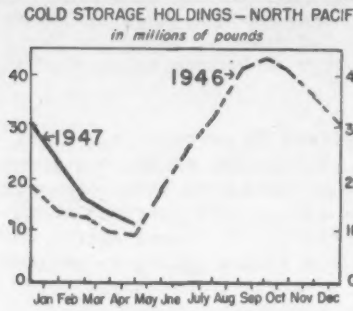
Otter-trawl landings of bottom fish dropped sharply during the month with 417,000 pounds delivered in 50 trips consisting mainly of rockfishes, English and petrale soles. Compared with April 1946, this was 133 fewer trips with a resultant decline in trawl fish of over 2-1/3 million pounds. Many trawlers continued to land their catches at Anacortes, Bellingham, and Everett, ports north of Seattle. With a continuance of heavy landings by the trawl fleet, it was definitely indicated at the close of the month that these northern ports faced the problem of oversupplied markets.

Receipts from Alaska continued to climb, reaching a total of 3,061,000 pounds, the bulk being frozen halibut, king, and silver salmon. These coastwise shipments contributed nearly 63 percent to Seattle's total volume and were about half a million pounds greater than the March consignments. Shipments from British Columbia were also on the upswing, increasing from 140,000 to 474,000 pounds with heavier imports reported for lingcod, sole fillets, and frozen halibut.

April's receipts raised the 1947 four-months' total volume to 16,055,000 pounds, about 5 percent above the comparable 1946 figure of 15,356,000 pounds.

* * * * *

NORTHWEST COLD STORAGE: Holdings of fish and shellfish in 30 cold-storage warehouses in Washington, Oregon, and Alaska on May 1 totaled 10,417,000 pounds, according to the Service's Market News Office at Seattle. This was 15 percent less than stocks on April 1, but nearly 1-1/3 million pounds greater than those on May 1, 1946.



More than half of the region's frozen stocks was held in Washington warehouses, about 38 percent was held in Alaska, and 9 percent in Oregon plants. All Alaskan freezers were cleared of shellfish and cured products during April with most of these items being shipped for storage at Seattle.

Many species indicated only moderate withdrawals, but the holdings for a number of them were greatly reduced. Stocks of chum salmon dropped 1,093,000 pounds; halibut, 554,000 pounds; and sablefish, 368,000 pounds. Most of the chums were being canned.

Heaviest inventories were reported for bait and animal food, 3,149,000 pounds; salmon, all species, 2,682,000 pounds; sablefish, 2,173,000 pounds; halibut, 794,000 pounds; and sole and other fillets, 342,000 pounds. In addition, 1,608,000 pounds of mild-cured salmon and 338,000 pounds of salted fish were in storage.

During April, 1,578,000 pounds were frozen compared with 2,033,000 pounds in March and 2,526,000 pounds in April a year ago. Nearly 87 percent of the total freezings, or 1,371,000 pounds, was bait and animal food with all except 13 percent being frozen in Alaska. Freezings of other fish and shellfish were relatively small.

* * * * *

LANDINGS IN SOUTHERN CALIFORNIA: April's production of fish at the southern California ports of San Pedro, Santa Monica, Newport Beach, and San Diego reveals the normal transition from winter to summer fishing. During the spring season, fishing is usually erratic, and this year has been no exception. While total production declined at all ports except San Diego, a few species, particularly barracuda, increased quite favorably. Prices remained fairly firm, although some normal seasonal declines were noted, according to the Service's Market News Office in San Pedro.

At San Pedro and Santa Monica, total production declined about 19 percent. The drop in bluefin tuna was most outstanding, but not unusual since the March production of this species was exceptionally high. Most other species followed their usual seasonal trend.

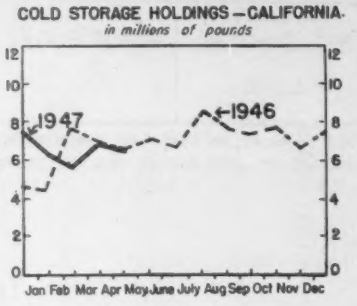
At Newport Beach, a decline of 25 percent took place. Anchovies, bonito, and yellowtail declined heavily, while most other species showed increases.

At San Diego, the total production increased 10 percent over March. Here the larger catch of barracuda, grouper, California halibut, and mackerel was sufficient to meet market demands for fresh fish, so no bonito or yellowtail was purchased from the boats which fish for these species for canning purposes.

There are some indications that the shortage of communication facilities resulting from the strike of long distance telephone operators during the last half of April tended to restrict sales by wholesalers, and, in turn, production was adversely affected.

* * * * *

COLD STORAGE: The freezings and holdings of fish and fishery products were fairly normal for the month of April, according to the Service's Market News Office in San Pedro.



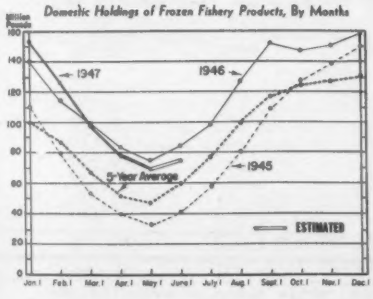
Freezings increased from 301,000 pounds during March to 366,000 pounds in April, or 22 percent. Freezings in April 1947 were, however, only slightly above the April 1946 freezings when 344,000 pounds of fish and shellfish were frozen.

The greatest significant changes in freezings were an increase in unclassified salt-water fish from 66,000 pounds in March to 115,000 pounds in April, and a decrease in shrimp from 171,000 pounds to 128,000 pounds.

Holdings of fishery products in cold storage as of May 1 declined 8 percent as compared with holdings on April 1, and declined 22 percent as compared with those of May 1, 1946. Salmon, halibut, sablefish, and shellfish had the most significant drops.

United States

FREEZINGS AND HOLDINGS Stocks of frozen fish and shellfish held on May 1 by firms reporting their activities to the Fish and Wildlife Service amounted to 70,202,000 pounds--10 percent below April 1, according to Current Fishery Statistics No. 344. Items held in considerably greater volume on May 1 than on the same date in 1946 were haddock, rosefish, and whiting fillets; sablefish; and salmon. Items showing marked declines were cod fillets, lake herring, smelt, and shrimp.



Data contained in this bulletin on the domestic freezing and holdings of frozen fishery products are based on reports from 213 plants. These are principally public cold-storage warehouses.

CANNED AND CURED FISH

Shrimp

SHRIMP PACK: The pack of canned shrimp for the period March 30 to April 26 amounted to 4,868 standard cases, according to reports from shrimp canneries operating under the Seafood Inspection Service of the Food and Drug Administration. This was a decline of 42 percent from the previous month's pack. The season's pack to April 26, however, amounting to 248,790 cases was approximately 90 percent greater than the pack for the same period last year.

Wet and Dry Pack Shrimp in all Sizes in Tin and Glass--Standard Cases*

MONTH		SEASON		
1947 Mar.30-Apr.26	1946 Mar.17-Apr.26	1946-47 July 1-Apr.26	1945-46 July 1-Mar.16	3-yr.average July 1-Apr.26
4,868	-	248,790	126,465	-

*All figures on basis of new standard case--48 No. 1 cans with 7 oz. per can in the wet pack and 6½ oz. per can in the dry pack.

Tuna and Mackerel

TUNA AND MACKEREL PACK: The production of canned tuna by California packers during April 1947, amounted to 384,667 standard cases, according to the California Division of Fish and Game--an increase of 31 percent over the pack for the preceding month and 20 percent over that of April 1946.

The pack for the first four months of 1947 totaled 1,014,948 cases, or 25 percent greater than that during the same period in 1946.

The pack of canned Pacific Coast mackerel in California declined sharply in April to only 3,720 cases which was only 20 percent of the pack for the preceding month. The four months' total (214,771 cases), however, exceeded the total for the same period in 1946 by over 300 percent.

California Pack of Tuna and Mackerel--Standard Cases*

Item	April 1947	March 1947	April 1946	Four mos. ending with April-- 1947	1946
	Cases	Cases	Cases	Cases	Cases
Tuna:					
Albacore	309	-	-	311	25
Bonito	455	1,170	157	12,172	4,010
Bluefin	11,589	18,960	6,676	44,938	42,383
Striped	34,894	46,550	35,637	123,497	64,112
Yellowfin	256,272	168,671	203,219	639,478	539,104
Yellowtail	839	1,423	1,274	6,856	20,548
Flakes	79,550	49,253	73,818	180,434	142,339
Tonno style	759	6,503	-	7,262	**
Total	384,667	292,530	320,781	1,014,948	812,521
Mackerel	3,720	19,309	229	214,771	51,059

*Standard cases of tuna represent cases of 48 7-ounce cans, while those of mackerel represent cases of 48 1-pound cans.

**As only one firm packed tonno style during 1946, no figures were published on the pack.

FISHERY BYPRODUCTS

Oil and Meal

PRODUCTION: The production of fish meal and oil remained at a normally low level during April. The yield of meal reported for the month amounted to only 2,959 tons, while only 138,470 gallons of oil were produced, according to Current Fishery Statistics No. 347.

Data released by the Bureau of the Census indicate that the factory consumption of fish oil for use in the production of soap, paint, and varnish in 1946 was considerably less than in the previous year. The consumption of fish oils for the production of soap amounted to only 39.7 million pounds, compared with 114.3 million pounds in 1945; while the use of these oils for paint and varnish amounted to 36.3 million pounds, compared with 42.3 million pounds in the previous year.

PRODUCTION OF FISH MEAL AND OIL, APRIL 1947

Fish Meal and Scrap[1]

Product	April 1947	April 1946	Four months ending with April 1947	Four months ending with April 1946	Total 1946[1]
	Tons	Tons	Tons	Tons	Tons
Meal and scrap:					
Groundfish	1,088	1,462	4,065	5,080	20,553
Herring, Alaska	-	-	-	-	14,989
Menhaden[2]	872	1,549	1,733	2,686	97,238
Pilchard (sardine)	-	-	3,163	5,727	34,500
Tuna and mackerel	999	796	2,842	1,962	12,256
Total	2,959	3,807	11,803	15,455	179,536

1/Preliminary data. 2/Includes a small quantity of herring meal produced in Maine.

Note: Data on the yield of fish meal and scrap are based on items which normally account for about 94 percent of the total production. Since cumulative totals are received monthly, they may not agree with totals previously published.

Fish Oils[1]

Product	April 1947	April 1946	Four months ending with April 1947	Four months ending with April 1946	Total 1946
	Gallons	Gallons	Gallons	Gallons	Gallons
Oil:					
Groundfish	3,672	4,915	5,255	33,631	301,136
Herring:					
Alaska	-	-	-	-	3,444,893
Maine	10,935	-	22,734	9,609	87,037
Menhaden	44,476	54,605	93,476	93,855	9,891,614
Pilchard (sardine)	-	-	148,919	425,287	4,741,689
Tuna and mackerel	70,606	14,858	114,750	47,757	367,667
Other	8,781	21,746	34,407	38,429	232,953
Total	138,470	96,124	419,541	648,568	19,066,989

1/Preliminary data. Does not include the production of fish liver oils.

Note: Data on the production of pilchard and tuna and mackerel meal and oil in California were furnished by the California Division of Marine Fisheries.

OTHER FISHERY NOTES

Additions to the Fleet of U.S. Fishing Vessels

A total of 136 vessels received their first documents as fishing craft during April 1947, compared with 95 in the same month the previous year, according to the Bureau of Customs, U. S. Treasury Department. The State of Washington led with 42 vessels documented during the month followed by California with 19 vessels, while Louisiana, North Carolina, and Florida tied for third place with 9 vessels each.

During the first four months of 1947, 358 vessels received their first documents as fishing craft, compared with 241 vessels during the same period in 1946.

Vessels Obtaining Their First Documents as Fishing Craft

Section	April		Four mos. ending with April		Twelve Months
	1947	1946	1947	1946	1946
	Number	Number	Number	Number	Number
New England	7	4	23	17	86
Middle Atlantic	6	1	24	16	74
Chesapeake Bay	5	10	23	20	71
South Atlantic and Gulf	40	31	122	79	351
Pacific Coast	67	39	128	79	375
Great Lakes	5	3	22	18	76
Alaska	3	-	6	2	19
Hawaii	2	1	7	1	17
Unknown	1	6	3	9	16
Total	136	95	358	241	1,085

Note: Vessels documented by the Bureau of the Customs are craft of 5 net tons and over.

Army Canned Fish Requirements

Tentative requirements for salmon and tuna fish from the 1947 pack for the Army and other Governmental agencies for which the Quartermaster Corps procures have been announced as follows:

Salmon - 10,376,000 pounds Tuna fish - 3,012,000 pounds

No estimates on the requirements for sardines, pilchard, or mackerel have been released at this time as these items are not procured seasonally, and will be purchased throughout the year as requirements demand.

"Black Douglas" Begins Fur-Seal Studies in North Pacific

Equipped as a floating laboratory, the motorship Black Douglas has left Seattle, Wash., for North Pacific waters to study the migration routes and food habits of the Alaska fur-seal herd that has its breeding grounds on the Pribilof Islands in Bering Sea, according to an announcement made on May 28 by Albert M. Day, Director, Fish and Wildlife Service.

The expedition, with Dr. Victor B. Scheffer, Service biologist, in charge, will spend the next 11 months seeking new data on where the seals go when they

leave the Pribilof Islands, what food they eat, and whether the young seals are preyed upon by other marine mammals.

On recommendation of the Department of State, the Fish and Wildlife Service began an investigation in 1941 to obtain scientific data regarding the migration routes and food habits of the seals. The necessity for inaugurating this investigation was due to the formal notice served by the Japanese Government that on October 23, 1941, it would abrogate the Fur-Seal Treaty of 1911 which prohibited pelagic sealing--the killing, capturing, or pursuing of the animals at sea. The United States, Great Britain, and Russia, as well as Japan, were signatories to this treaty.

FUR SEALS, ST. PAUL ISLAND, ALASKA

As the reason for cancelling the treaty, Japan claimed that the fur-seal herd, at least in part, migrated down the Asiatic shore and was damaging Japan's fishing industry. The findings of early investigators on the North American side, however, did not agree with this contention. The State Department then recommended that the Fish and Wildlife Service bring up to date its scientific data on seals to determine the validity of Japan's claims.

The Black Douglas, a former schooner yacht, was purchased by the Service in 1941 by a special Congressional appropriation and all required repairs and alterations were made at Savannah, Ga. Before the vessel reached Seattle, war was declared and the seal investigation was discontinued. The Black Douglas was requisitioned by the Navy and served during the war as a Navy patrol vessel.

From Seattle, the Black Douglas will follow the fur-seal herd on the spring migration to its breeding grounds, conduct sealing and tagging operations on and around the Islands, and later in the fall, will follow the herd south to continue the study of migration routes to winter waters. Extensive studies of the stomach contents of the seals will be carried on to determine if they are feeding upon valuable commercial food fishes.

The Black Douglas and its crew will be used also to gather information on other marine life such as killer whales, hair seals, sea lions, and sea otters to ascertain if any of these mammals prey upon the young seals after they leave the Islands on their winter migration.

Since the Government assumed direct control of the fur-seal herd in 1910, the number of animals has increased from 132,279 to 3,386,000 in 1946. The herd now has a capital value in excess of $100,000,000.

Closing of Halibut Areas

Under authority of the Pacific Halibut Fishery Convention between the United States of America and the Dominion of Canada, and as provided by regulations effective March 17, 1947, the International Fisheries Commission on May 27 determined

upon the date of June 8th, midnight, as that upon which Areas 1B and 2 as defined in the said regulations shall be closed to all halibut fishing, except that provided for in Article I of the Convention.

Area 1B is defined to include all convention waters between a line running northeast and southwest through Cape Blanco Light and a line running northeast and southwest through Willapa Bay Light on Cape Shoalwater.

Area 2 is defined to include all convention waters off the coasts of the United States of America and of Alaska and of the Dominion of Canada between Area 1B and a line running through the most westerly point of Glacier Bay, Alaska, to Cape Spencer Light, thence south one-quarter east.

Reference should be had to a copy of the regulations for further details regarding these boundaries.

The records of the International Fisheries Commission show that for the period from May 1 to May 31, 1947, inclusive, the following amounts of halibut have been landed in the various ports on the Pacific Coast from Areas 2 and 3:

	1947		1946	
	Area 2	Area 3	Area 2	Area 3
U. S. Fleet	6,520,000	1,200,000	8,394,000	5,392,000
Canadian Fleet	11,348,000	98,000	9,524,000	101,000
	17,868,000	1,298,000	17,918,000	5,493,000

During May 1947, most of the Seattle fleet was tied up due to a dispute between the owners and fishermen.

FAO Program for 1948

The 1948 budget for the third financial year of the Food and Agriculture Organization as recommended for submission to the Conference in Geneva late in August totals $5,000,000. The Fisheries Division estimate amounts to $196,365 for 1948 as compared with an estimate of $184,350 for 1947, and actual expenditures of $13,612 in 1946. The major items in the 1948 budget are:

Personal Services - 33 positions - $139,590

Meetings - $17,600 Travel - $16,390 Printing - $22,875

The budget estimates outline the program for 1948 as follows:

PROGRAM

Under the Constitution of the Food and Agriculture Organization, its Fisheries Division is responsible for:

1. Securing and disseminating adequate information about fisheries for the purpose of bettering the nutritional levels, expanding consumption and securing optimum utilization.

2. Making recommendations to the Director-General as to the need for action by Member Governments, when such is revealed on analysis of the data and information collected.

3. Otherwise carrying out the recommendations of the Conference as it concerns fish and fisheries.

The functions of the Division are carried out through three Branches; namely, Biology; Economics and Statistics; and Technology.

BIOLOGICAL BRANCH: The work of the Biological Branch in 1948 will include:

1. Establishing Regional Councils of Marine Scientists. As recommended by the Standing Advisory Committee (SAC), regional councils of marine scientists will be established to bring together existing data and to recommend such studies by governments as are necessary for the full development and conservation of marine resources. The information thus secured will be reported for the guidance of nations with respect to fishing on the high seas. A functioning organization exists in Europe (The International Council for the Exploration of the Sea). The SAC designated three areas for the establishment of such bodies:

   (a) Northwestern Atlantic,
   (b) Southeastern Asia, and
   (c) Mediterranean

2. Preparing a classified world roster of fisheries biologists.

3. Preparing a classified list of marine biological schools and institutions of the world.

4. Recommending nomenclature and synonyms of commercial fish.

5. Compiling a catalogue of potential fisheries resources.

TECHNOLOGICAL BRANCH: The work of the Technological Branch in 1948 will include:

1. Establishing a clearing house for periodic reports on research concerning the scientific handling of fisheries products.

2. Establishing a classified roster of fisheries technologists.

3. Compiling a catalogue of fisheries technological institutions and training centers and an assessment of world needs for such.

4. In cooperation with the Biological Branch, making a survey of the methods of fishing with special emphasis upon recent innovations, with the object of furnishing information as to the suitability for use in various regions.

ECONOMICS BRANCH: The Economics Branch is concerned with economic statistics in the field of fisheries activities. Close cooperation will be maintained with the other branches of the Division and, particularly on statistical work, with the Economics and Statistics Division. The work of the Economics Branch in 1948 will include:

1. Collecting existing statistics of fisheries production, processing and trade for publication in monthly, quarterly, and yearly reports.

2. Preparing a yearbook of Fisheries Statistics.

3. Developing an agreement between countries on the development of common conversion factors and uniform methods of reporting.

4. Furnishing on request, technical advice with respect to the establishment of statistical services in those countries where such services are inadequate or do not exist.

5. As recommended by the Preparatory Commission on World Food Proposals, making a comprehensive study and analysis of the international trade in salted fish products for the purpose of supplying data necessary to governments when considering commodity arrangements.

6. Preparing for a World Census of Fisheries in 1950.

MEETINGS: During 1948, meetings are planned for the Standing Advisory Committee in Washington and at the Conference. There are also proposed conferences on Quality Standards of Fish[1/] at Washington, on Fisheries Statistics at The Hague, and for Regional Groups of Marine Scientists at Ottawa, Singapore, Rome, and Capetown.

PRINTING: The printing estimates propose the issuance of the following publications during 1948:

Quarterly Journal. Printed, four issues of 48 pages each in English, French, and Spanish. This publication will carry articles by individuals outstanding in the fields of ichthyology, fisheries technology, and fisheries economics. It will also carry reviews and digests of particularly significant articles appearing in various fisheries journals. The Quarterly Journal will contain a certain amount of statistical information on trade and revised figures on landings and utilization.

Fisheries Bulletin. Multilithed, 12 issues of 24 pages each in English, French, and Spanish. The primary purpose of this bulletin will be to disseminate current fishery statistics on landings and utilization as reported to FAO. It will also carry monthly figures on international trade in fishery products as published in monthly reports of statistical agencies of member governments. The Bulletin will serve as a medium for keeping member countries currently informed of new developments in fishing gear, boats, methods of fishing, processing, utilization of by-products, etc.

Fisheries Statistical Yearbook. Printed, one issue, 96 pages in English and French (combined). An annual collection of basic statistics in the field of fisheries. There is a great need for an authoritative source of world-wide data, and it is clearly FAO's place to supply one.

Roster of Fisheries Institutions, Scientists, etc. Multilithed, one issue, 200 pages in English.

1/Quality Standards of Fish. The question of quality standards was discussed at the Quebec Conference and the suggestion was made that studies be undertaken "to ensure the production of wholesome products, standardized where possible, with respect to quality, packaging, weight, and designation." Some of the member Governments have recently reemphasized the desirability of the Fisheries Division directing its attention to these matters at an early date. It is proposed that preliminary discussions be held at the third session of the Conference, the subject being carried on the draft agenda of Commission II. After sufficient background data has been collected, it is intended that a meeting on the technical level be convened in Washington early in 1948.

Farm Fish Ponds

The Department of Agriculture has issued a new bulletin entitled Farm Fish Ponds for Food and Good Land Use as part of the Soil Conservation Service's program to help farmers get the best and safest returns from every class of farm land. The bulletin has four main sections: "Management of Fish Ponds," "How to Build a Good Pond," "Protecting the Pond from Erosion," and "Old Ponds and Small Lakes."

This publication, Farmer's Bulletin No. 1983, may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. The price is 10 cents per copy.

Fishery Technology Abstract Card System

The Seattle Fishery Technological Laboratory has developed and maintained during the past four and one-half years, a comprehensive card file of abstracts of articles pertaining to fishery technology appearing in the current literature.

A description of the system and the subjects covered by it are contained in "Fishery Technology Abstract Card System," Fishery Leaflet 232.

Copies of this publication may be obtained free of charge by writing to the Fish and Wildlife Service, U. S. Department of the Interior, Merchandise Mart, Chicago 54, Ill.

Import Quota Set

The Bureau of Customs announced on June 12 that the tariff-rate quota of 15,000,000 pounds of fish, fresh or frozen (whether or not packed in ice), filleted, skinned, boned, sliced, or divided into portions, not specially provided for: cod, haddock, hake, pollock, cusk, and rosefish, entitled to entry for consumption at 1-7/8 cents per pound during the calendar year 1947 has been increased to 23,906,423 pounds. The quota in 1946 was 20,380,724 pounds.

The Canadian Trade Agreement of November 25, 1938, prescribed that if the average apparent annual consumption of such fish in the United States during the three calendar years preceding the year in which such fish were entered, or withdrawn from warehouse for consumption, exceeds 100,000,000 pounds, an additional quantity of such fish equal to the amount by which 15 per centum of such average apparent annual consumption exceeds the 15,000,000 pounds may be entered, or withdrawn from warehouse, for consumption in that year at the 1-7/8 cents per pound rate. It has been determined that the average annual consumption of such fish for the calendar years 1944, 1945, and 1946 was 159,376,156 pounds.

Studies on Oyster Feeding

An article entitled "Feeding of Oysters in Relation to Density of Microorganisms," by V. L. Loosanoff and J. B. Engle, Chemists at the Fish and Wildlife Service Marine Laboratory, Milford, Conn., appeared in the March 7, 1947, issue of Science. Biologists, according to this article, do not agree on the effect of different quantities of material suspended in water upon the efficiency of the feeding of oysters. To clarify at least certain aspects of this problem, a study was made to determine the effect of different concentrations of microorganisms upon the rate of water pumping and, therefore, feeding of oysters. This article is a resumé of the findings of this study.

Tokyo Fish Consumption

According to the latest computations, based on recently received statistical information from Japan (Japanese Economic Statistics Bulletin No. 5, January 1947), the average quantity of fish and other aquatic products consumed at home, per household, in Tokyo is 138.8 pounds per year. This compares with an urban United States consumption per household (1942) of 52.52 pounds per year.

The size of the average Tokyo family is 3.74 persons compared with the average American family of 3.41 persons.

Purchases of Fish by Department of Agriculture

Purchases of fishery products by the U. S. Department of Agriculture during March amounted to $768,927, a decline of 63 percent from the February purchases, valued at $2,067,538. For the first time in several months, purchases of items other than salmon and pilchards were made, the additional commodities being hake and herring.

Total purchases for the first three months of 1947 amounted to $10,711,709. For the period July 1946 through March 1947, purchases totaling $23,333,564 were made.

Purchases of Fishery Products by USDA

Commodity	Unit	March 1947		July 1946 thru Mar. 1947	
		Quantity	F.O.B. Cost	Quantity	F.O.B. Cost
FISH			Dollars		Dollars
Fish, ground, canned	Cases	-	-	1,359	8,308
Herring, "	"	40,000	120,000	47,955	168,631
Mackerel, "	"	-	-	27,688	196,634
Hake, "	"	65,900	197,700	65,900	197,700
Salmon, "	"	22,820	307,930	1,216,777	17,777,690
Pilchards, "	"	21,338	143,297	774,322	4,984,601
Total	"	150,058	768,927	2,134,001	23,333,564

Wholesale and Retail Prices

Led by advances for farm products, average primary market prices of all commodities rose 3.6 percent between February 15, and March 15, 1947, according to the Bureau of Labor Statistics, U. S. Department of Labor. The average retail price of fresh and frozen fish, although following the general trend, made gains of only 2.5 percent during the same period. Gains in the price of canned red salmon were only fractional, but the percentage gain in the retail price of canned pink salmon was but one-tenth of 1 percent less than the average gain for all commodities.

Wholesale and Retail Prices

Item	Unit	Percentage change from--		
Wholesale: (1926 = 100)		Mar. 15, 1947	Feb. 15, 1947	Mar. 16, 1946
All commodities	Index No.	148.3	+3.6	+36.8
Foods	do	166.5	+3.5	+52.1
Fish:		Mar. 1947	Feb. 1947	Mar. 1946
Canned salmon, Seattle:				
Pink, No. 1, Tall	$ per doz. cans	3.066	-1.0	+55.0
Red, No. 1, Tall	do	5.363	0	+45.0
Cod, cured, large shore, Gloucester, Mass.	$ per 100 pounds	15.00	0	+11
Herring, pickled, N. Y.	¢ per pound	12.00	0	0
Salmon, Alaska, smoked, N. Y.	do	35.00	0	0
Retail: (1935 = 100)		Mar. 15, 1947	Feb. 15, 1947	Mar. 15, 1946
All foods	Index No.	189.5	+3.9	+35.3
Fish:				
Fresh and canned	do	266.0	+2.8	+16.8
Fresh and frozen	¢ per pound	40.8	+2.5	+ 6.8
Canned salmon:				
Pink	¢ per pound can	37.9	+3.5	+52.3
Red	do	59.2	+0.7	+36.7

JAPANESE FISHERIES

Prior to World War II, Japan was the foremost fishing country in the world.

(a) Annual catches in home waters were 2,500,000 to 3,500,000 metric tons; catches overseas including those of colonial waters amounted to an additional 2,000,000 to 3,500,000 tons. Total Japanese production of marine products accounted for more than one-fourth of the world's total.

(b) Full-time and part-time fishermen in Japan numbered about 1,500,000.

(c) Japanese fishing boats numbered about 355,000 of which 75,000 were powered.

(d) Japanese fishing operations were world-wide.

--Fishery Leaflet 249

FOREIGN FISHERY TRADE

Imports and Exports

GROUNDFISH IMPORTS: During April, there were 1,887,541 pounds of fresh and frozen groundfish imported into the United States under the tariff classification "Fish, fresh or frozen fillets, steaks, etc., of cod, haddock, hake, cusk, pollock, and rosefish," according to a report from the Bureau of Customs of the Treasury Department. This was 55 percent less than the amount imported during the corresponding period in 1946, and is in keeping with the trend of imports for the first third of the year, which were 56 percent less than those for the first three months of 1946.

Country	1947		1946	
	April	4-month Total	April	4-month Total
Canada	1,260,631	4,923,359	3,823,459	12,744,271
Newfoundland	339,910	1,449,660	334,190	1,371,237
Iceland	287,000	871,402	-	2,417,450
Norway	-	-	1,500	1,500
Total	1,887,541	7,244,421	4,159,149	16,534,458

Belgium

PRODUCTION: During the years just before the war, the Belgian fish catch averaged about 40,000 metric tons per year, or about one-quarter of one percent of the world fish catch. The value of the prewar Belgian fish catch averaged about 120 million francs ($2,745,000) annually. No data are available on production during 1940, but it is known that practically no fishing was done after the German invasion in May. In 1941, only a small amount of fish was caught, as most of the boats had either been sunk or had fled to England, and such fishing as was done was restricted to coastal waters. In 1942, the volume of fish caught reached about half of the prewar total. Beginning with 1943, the Belgian fish catch exceeded the prewar average, due to very large herring runs. For the calendar year 1946, a new high production was attained of almost 70,000 metric tons for a value of 446 million francs ($10,201,150). Table 1 (see p. 47) shows the quantities and value of fish landed in Belgian fishing ports during the periods indicated.

By far the largest part of the Belgian fish catch is landed at Ostend. The details of some of the above calendar year statistics, by port, are given in Table 2 (see p. 47).

It should be pointed out, however, that the above figures do not represent the total fish catch of the Belgian fishing fleet, as Belgian boats occasionally land and sell their fish catch directly in English and Scotch ports.

Note: The illustrations are reproductions of sketches used by the Belgian Government in an effort to move the quantities of herring referred to in the article.

During the first five months of this year, the Belgian fishing catch has been very satisfactory, both from the standpoint of quantity and value (see Table 3, p. 48).

Table 1 - Annual Catch

Year	Fish		Shellfish and Mollusk	Total	
	Deep-sea	Salt-water			
	Tons	Tons	Tons	Tons	Francs
1929	15,453	17,352	110	32,915	82,956
1930	14,093	19,311	103	33,507	91,805
1931	14,461	26,605	141	41,207	76,360
1932	16,758	11,004	270	28,032	65,927
1933	19,161	7,801	180	27,142	75,844
1934	18,352	9,935	247	28,534	77,981
1935	20,438	15,412	2,987	38,837	101,642
1936	23,762	12,762	3,850	40,380	120,226
1937	27,219	7,344	4,344	38,907	118,428
1938	27,333	8,657	3,145	39,135	124,379
1939	26,279	10,590	2,991	39,860	118,253
1941	601	1,470	1,663	3,735	39,393
1942	1,581	19,204	1,371	22,156	177,707
1943	2,546	57,897	122	60,565	367,832
1944	740	49,135	-	49,875	268,837
1945	12,981	32,269	354	45,604	463,763
1946	29,575	38,545	1,574	69,694	445,872

Source: National Statistical Institute. Quantities - Metric Tons. Value - Thous. francs.

Kinds of Fish: From the standpoint of weight, herring are the most important fish caught by the Belgian fishing fleet. Before the war, the herring catch varied

Table 2 - Quantity of Fish Unloaded in Belgian Fishing Ports

Year	Ostend	Blankenberg	Zeebrugge	Nieuport	Total
1946	Kilos	Kilos	Kilos	Kilos	Kilos
1st quarter	20,405,923	241,395	2,593,106	2,940,333	26,180,757
2nd quarter	7,526,666	171,090	1,998,589	527,110	10,223,455
3rd quarter	13,408,033	99,159	1,488,884	312,462	15,308,528
4th quarter	14,955,439	64,394	1,694,649	1,266,563	17,981,045
Total	56,296,061	576,038	7,775,228	5,046,468	69,693,795
Average - 1936-38	32,946,905	480,880	4,413,702	1,630,358	1/39,471,845

1/In 1936, approximately 90,000 kilograms of fish unloaded at Antwerp were not included in the average 1936-38.

Source: Marine Administration

widely, but averaged about 8,000 tons, or 20 percent of the total. Most of the herring catch occurs in the coastal waters off Belgium, with some additional quantities caught in the Flagen area off Scotland.

During the German occupation, the Flagen area was not available to the Belgian fishing boats. By good fortune, however, there were large runs of spent herring in the coastal waters of Belgium. In view of the lack of meat and other protein foods during the war period, the herring supplies were invaluable to Belgium, supplying a substantial part of its protein requirements. No one knows exactly why the herring appeared, but one theory is that many small herring which ordinarily would have been killed in the drag-net operations off the English coast had a chance to grow up because of the reduction in the English trawling. These herring, it is thought, may have migrated to Belgian waters.

Table 3 - Monthly Catch - 1947

Month	Kilos	Francs	Month	Kilos	Francs
January	14,929,307	59,020,062	April	4,170,190	43,365,039
February	6,598,798	38,496,123	May	4,201,216	40,961,370
March	6,400,107	56,796,505			

The season for spent herrings is from about the middle of December to the middle of March. The peak season for spent herring was that of 1943-44, when 48,000 tons of spent herring were caught. Since then, the catch has been declining each year. Table 4 shows the amount of the spent herring catch during the past few seasons.

Table 4 - Seasonal Spent Herring Catch

Season	Kilos	Season	Kilos
1941-42	10,148,293	1944-45	32,309,540
1942-43	45,697,797	1945-46	26,369,350
1943-44	47,999,264	1946-47	22,243,598

From the standpoint of value, flounder (including dab, plaice, sole, and turbot) constitute the most important fish caught by the Belgian fishing fleet,

Table 5 - Quantity of Fish Landed at Belgian Fishing Ports

Kind of Fish	1938	1946	Kind of Fish	1938	1946
Deep Sea:	Kilos	Kilos	Deep Sea (Cont.):	Kilos	Kilos
Flounder	13,376	25,145	Turbot	741,562	798,800
Weever	121,557	3,775	Sole	2,272,495	3,096,550
Angler-fish	412,403	36,609	Pollack	234,955	9,372
Brill	218,396	201,702	Whiting	3,158,577	3,640,640
Porbeagle	18,898	5,106	Sea perch	173,245	16,605
Halibut	35,388	33,296	Dogfish	380,529	413,352
Berger	1,994	11	Spotted dogfish	316,426	525,912
Cod	4,156,880	4,960,870	Conger eel	204,855	44,617
Sebaste	559,610	40,116	Sea dace	50,355	69,063
Red Gurnet	1,031,585	592,088	John-dory	118,677	6,148
Surmullet	9,325	23,395	Miscellaneous	123,620	-
Coalfish	1,586,335	715,111			
Ling	390,180	167,195	Pelagic:		
Brosme	27,025	2,882	Herring	5,883,382	37,131,718
Whiting	1,084,800	12,774	Mackerel	454,830	597,895
Plaice	3,065,051	6,323,201	Sprat	1,159,626	815,152
Scaurel	42,870	49,676	Salmon	-	26
Ray	3,437,759	3,778,591			
Ray (white)	447,690	471,826	Shell and Mollusks:		
Gurnard	304,152	211,633	Cuttle-fish	-	2,120
Dab	376,846	182,789	Whelk	18,250	-
Flotte	541,195	123,731	Crabs	13,631	280
Haddock	1,310,075	2,194,475	Lobsters	4,809	{
Scotch Sole	789,039	72,625	Small lobsters	158,752	{ 8,104
Dab Sole	269,874	44,071	Shrimp and others	2,949,915	1,563,784
Whiting-putt	450,885	81,788			
Sturgeon	4,298	369	Total	39,135,077	69,693,795

Source: National Statistical Institute

as they usually represent about 35 to 40 percent of the total value of fish caught. A Brussels firm has plans under way for filleting, freezing, and exporting sole to the United States.

Groundfish (consisting chiefly of cod, but also including haddock, hake, and pollock) usually average between 15 and 20 percent of the total catch, both on a weight and a value basis.

Table 5 (see p. 48) shows the quantity of the Belgian fish catch in 1938 and 1946, by type of fish.

Consumption: Before the war, the Belgian consumption of fish averaged about 11 kilograms (24.2 lbs.) per capita per year, as is shown in Table 6.

Table 6 - Per Capita Consumption

	1937	1938	1939	1946
	Kilos	Kilos	Kilos	Kilos
Fish landed at Belgian fishing ports	38,906,884	39,135,077	39,860,137	69,694,000
Imports	71,115,300	69,153,600	60,961,100	73,636,000
Exports	16,096,600	11,115,700	10,112,600	7,134,000
Belgian consumption	93,925,584	97,172,977	91,708,637	136,196,000
Per capita consumption	11.2	11.6	11.0	16.4

During 1946, Belgian consumption of fish rose to a level about 50 percent above prewar, the 1946 total being about 16.4 kilograms (36.1 lbs.) per capita.

The sale of fresh and frozen fish has been entirely free since September 10, 1945. More recently, canned fish has been removed from the ration.

As pointed out in the September 1946 report of Belgium to the FAO, Belgium before the war regulated fish imports and exports by quotas in order to safeguard the interests of the Belgian fish industry and trade.

Belgium possesses an industry for the transformation of fish wastes.

By decree of October 20, 1945, a Professional Council of Sea Fishing was created in Belgium.

Canned Fish: With respect to canned fish, a royal decree issued in 1937 required that their source be marked. Before the war, Belgium imported about two million dollars, annually, of canned fish, of which the bulk came from Japan and Portugal, the United States supplying only about 10 percent of the total. The United States exports of canned fish to Belgium consisted chiefly of pilchards, salmon, and shrimp.

The prewar imports of canned fish amounted to almost 1,000 tons per month. For the first four months of this year, Belgian imports of canned fish have been as shown in Table 7.

Table 7 - Imports of Canned Fish

Month	Metric Tons	Francs	Month	Metric Tons	Francs
January	1,223	31,830,000	March	1,213	30,236,000
February	874	21,380,000	April	488	14,207,000

Average imports for the first four months (Table 8, p. 50) have thus far totaled about the same as before the war. During January, February, and March, about 90

percent of the imports came from Portugal. In April, Norway and Portugal each supplied about 40 percent of the total. The balance of the Belgian imports of canned fish came in small amounts from a large number of other countries. Imports from the United States during the first four months of this year were as shown in Table 8.

Table 8 - Imports of Canned Fish From the United States

Month	Metric Tons	Francs	Month	Metric Tons	Francs
January	6	382,000	March	9	801,000
February	17	128,000	April	31	1,910,000

Areas Fished: Belgian fishing boats operate mostly in the coastal waters of Belgium and in the North Sea, but since the return of the larger boats from England, a few of these have done some fishing in the Mine-Head area west of Ireland and in the neighborhood of Iceland, and even off the coasts of Portugal, Spain, and in the White Sea. The figures on the Belgian fish catch by areas are listed in Table 9.

Table 9 - Quantity of Fish Directly Landed in Belgium From Various Fishing Fields

Fishing Field	Average 1936-38	1946				Total
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
	Kilos	Kilos	Kilos	Kilos	Kilos	Kilos
Coast	6,075,660	21,706,499	2,975,754	2,318,282	9,228,438	36,228,973
Southern North Sea ..	9,159,854	2,307,218	3,832,539	1,927,802	1,134,024	9,201,583
Central North Sea ...	3,933,273	1,959,804	1,017,035	761,339	2,086,823	5,825,876
Northern North Sea ..	1,526,436	-	1,212,084	784,777	467,015	2,463,876
Moray-Firth	960,375	-	-	-	-	-
Fladen	1,397,100	56,607	-	8,242,265	4,127,031	12,425,903
Channel	898,988	-	-	-	-	-
Bristol Channel	5,339,397	-	-	-	-	-
Mine-Head	2,576,077	150,629	230,248	573,194	322,269	1,276,340
West Scotland	533,988	-	-	-	-	-
Iceland	3,949,930	-	955,795	679,905	570,367	2,206,067
Portugal-Morocco-Spain	3,001,987	-	-	20,974	-	20,974
White Sea	148,230	-	-	-	45,078	45,078

Although the coastal waters supply most of the Belgian fish catch, the catch there consists largely of spent herring, and the quantity of fish caught in these waters is declining as the coastal zone has been practically fished out in the past few years. The Belgian sea coast is quite short, extending only for about 40 miles.

Belgian Fishing Fleet: During the war, the Belgian fishing fleet lost a total of 178 boats, of which 150 were lost in Belgium, and 28 in England. Of the latter, 11 were lost in the service of the British Navy and 17 while fishing for British account.

By the end of 1946, the Belgian fishing fleet had been practically reconstituted to its prewar numbers, due primarily to the retransformation of the fishing boats which had been loaned to England during the war. The total number of boats at the end of 1946 was 479, as compared with 510 in 1939. During 1946, there was also some new boat construction, and the number of fishing boats increased by 80 during the year. The number of large sea-going vessels remains below prewar, as is indicated in Table 10 (see p. 51).

By decree, appearing in the Moniteur Belge of January 15, 1947, fishing in the territorial waters by boats having a motive force exceeding 200 horsepower was forbidden for the duration of the 1946-47 herring season.

Table 11 shows the distribution of Belgian fishing boats, by port, at the end of 1946.

Table 10 - Fishing Craft

Vessels	Year End			Difference
	1939	1945	1946	1945-46
Shrimp fishing boats	236	269	250	-19
Coastal fishing boats	85	61	72	11
Boats for average fishing	123	58	108	50
Sea-going fishing vessels:				
Limited distance	44	10	35	25
Unlimited distance	22	1	14	13
Total	510	399	479	80

As of May 1, 1947, the Belgian fishing fleet consisted of 479 units as compared with 510 at the end of 1939; on the same dates the motor power was respectively 53,397 horsepower (May 1, 1947) as compared with the 1939 figure of 59,672 horsepower; the latest tonnage was 23,567 metric tons as compared with 28,037 tons in 1939.

Table 11 - Distribution of Fishing Craft

Type	Ports	Firms	Boats	Tonnage	Type	Ports	Firms	Boats	Tonnage
		Number	Number	Gross			Number	Number	Gross
Motor boats	Blankenberg	18	21	417	Steam boats	Blankenberg	-	-	-
	Nieuport	79	91	1,775		Nieuport	-	-	-
	Ostend	213	238	12,500		Ostend	3	13	4,798
	Zeebrugge	100	116	3,689		Zeebrugge	-	-	-
	Total-1946	410	466	18,381		Total-1946	3	13	4,798
	Total-1945	353	399	10,922		Total-1945	1	1	1/ 129

1/Net tonnage.

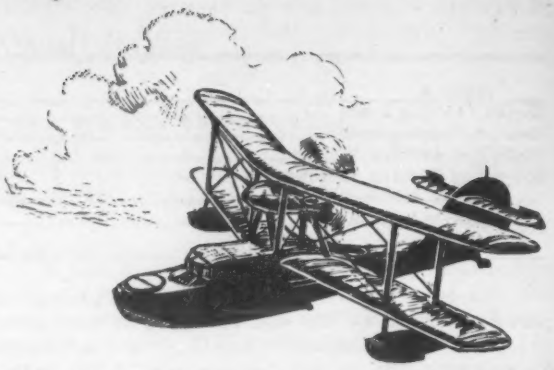
Number of Fishermen: During 1946, the number of fishermen increased from 1,617 to 1,992, but the latter total is still about 120 below prewar. Table 12 gives the breakdown of this increase.

Table 12 - Distribution of Fishermen

Item	Blankenberg	Nieuport	Ostend	Zeebrugge	1946 Total	1945 Total
Number of boats equipped	15	79	209	105	408	378
Deck Personnel						
18 yrs. and over:						
Captains	15	79	209	105	408	378
Sailors	18	134	546	173	871	629
Novices	1	21	55	31	108	87
Less than 18 yrs.:						
Shipboys	2	23	92	56	173	183
Machine room personnel	11	65	255	101	432	340
Total	47	322	1,157	466	1,992	1,617
Boat owners	4	27	25	21	77	64

A decree, appearing in the Moniteur Belge of January 15, 1947, fixed the base salaries paid to various categories of fishermen, for use in determining payments due for accident insurance.

England



WHALING--BY AIR:[1] The amphibian aircraft used as whale spotters by the whaler S.S. Balaena during its recent expedition to the Antarctic performed favorably, according to the American Consulate, Bristol, England.

It was revealed that the two aircraft totaled between them 100 flying hours. The planes were launched from the whaling ship by the catapult and taken aboard again by crane when they had completed their patrols. Cruising at about 10,000 feet, the aircraft would radio the location of a school of whales to killers. The aircraft were said to be particularly valuable in spotting sperm whales which spend a great deal of time well below the sea surface.

The lowest temperature recorded was 17° F.; normally it was about 27° or 28°. Sudden squalls were the worst part of the weather.

The potentialities of aircraft as whale spotters were not fully exploited, in the opinion of those engaged in the work, because whales were particularly numerous; it was reported that at one time great schools of them bumped against the Balaena's sides. It is felt, however, that there is a future for aircraft in this work and that they will prove invaluable in seasons when there are not so many whales about.

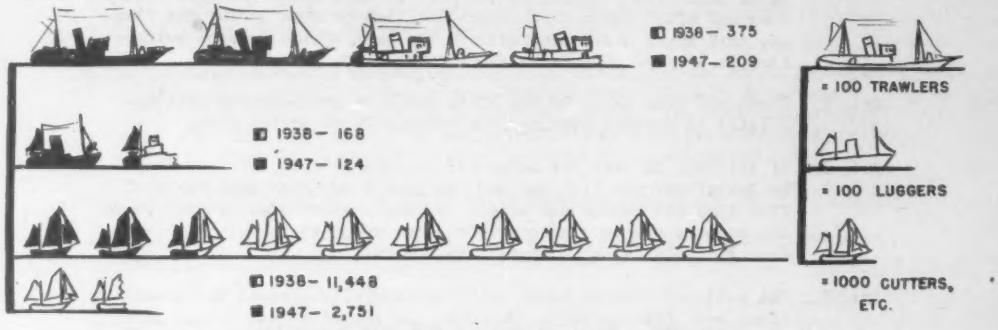
Germany

FISHERIES: In order to increase the fish catch for the bi-zonal area, further steps are now being taken to make available to the German economy for fishing purposes, a portion of the prewar German fishing fleet used by the German Navy during the war and taken over as reparations by the Tripartite Naval Commission, according to the Office of Military Government for Germany (U. S.). The portion allocated by the Commission to the United States consists of 25 trawlers and 129 KFK cutters (Kuesten-Fischerei-Kutter) which will be converted to fishing boats as rapidly as possible.

When this fishing vessel conversion program is completed, the combined British and U. S. Zones will have a fleet consisting of 209 trawlers, 124 luggers, and 2,751 cutters, and other small craft operating in the North Sea, Baltic Sea, and waters adjacent to Iceland and Bear Island. With fish supplementing the supply of fresh meat in the bi-zonal area and, thereby, increasing the protein content of the German diet, the importance of this program cannot be overestimated.

1/"British Whaling Activities," Commercial Fisheries Review, April 1947, p. 37.

The German fishing fleet in 1938 consisted of 375 trawlers, 168 luggers, and 11,448 cutters and other small craft. Most of these vessels at the outbreak of war were taken over by the German Navy to be used for other-than-fishing purposes. The KFK cutters used by the German Navy were so constructed that they could be converted to fishing vessels in case of a Nazi victory. Many of these vessels were sunk or otherwise incapacitated during the war while others that were still serviceable at war's end were either used by the Allies for minesweeping purposes or were operating in the Baltic Sea or other areas not under UK/US jurisdiction. As the minesweeping activities came to an end, more and more of these vessels became available for conversion but shortages of materials and marine railways have seriously hampered the program.



COMPARISON OF GERMAN FISHING FLEETS, 1938-1947

The Fisheries Bipartite Control Group, which is composed of 10 Britishers and 3 Americans, supervises not only operations of the fishing fleet but also fish imports, processing, and distribution. Prior to the bi-zonal economic merger on January 1, 1947, the total catch, which averaged about 20,000 tons monthly during 1946, was pooled with 55 percent going to the British Zone and 45 percent to the U. S. Zone. The distribution of the catch since that date has been arranged on the basis of 500 grams of processed fish per ration period for each non-self-supplier in the combined area.

Iceland

INSPECTION AND HANDLING OF FISH FOR EXPORT: Iceland's interest in producing top quality frozen fish for the export market is well exemplified in the care taken to insure the use of the best possible procedures in the catching and handling of the fish and the preparation, packaging, transportation, and inspection of the product. The regulations governing these matters, as issued by the Ministry of Industries on January 10, 1947, follow:

REGULATIONS ON THE HANDLING OF FISH FROZEN FOR EXPORT

Chapter 1. Equipment of Fishing Boats and Ships.

Art. 1. The holds of fishing vessels and boats, together with racks and shelves in the holds, shall be painted or varnished with durable paint or varnish, at least twice a year. A chief inspector can, however, allow that this be done only once a year if boats are not much used.

Art. 2. The holds shall be made in such a way that the fish is not liable to be bruised on bars or ruffles. The bottom of the holds shall be covered with closely barred racks. The bearing bars of the racks shall lie longwise on the hold so that water can flow freely down and aft. Boats which store the fish on deck during the fishing trip shall also have racks on the part of the deck on which fish is stored. All racks shall be easy to clean under.

Art. 3. Front and rear walls of the holds shall be sufficiently well insulated to prevent heating from forecastle or engine room.

Art. 4. If the hold is over one meter (39.37 inches) deep, shelves shall be installed when fish is iced, in such a way that each layer of fish does not exceed one meter. In the case of small boats, where the holds are only just over one meter deep, it is permissible to fill the holds without installing shelves.

Art. 5. The holds of fishing boats shall be carefully cleaned and washed after each fishing tour. Moreover, an inspector can demand that they are washed in sterilizing substances if he considers it necessary.

Chapter II. The Handling of the Catch.

Art. 6. All fish shall be bled by cutting across the thoracic arteries on both sides as soon it comes on deck.

Art. 7. In the case of boats which do not land the catch daily, all fish shall be eviscerated as soon as possible. Boats which land the catch daily, may bring the fish ashore ungutted, but during the summer it is desirable that all fish is eviscerated immediately on catching.

Art. 8. All fish, whether it is gutted at sea or on land, shall be washed immediately after gutting. Care shall be taken not to leave any remainders of liver, guts or blood in the belly cavity.

The supply of water for washing shall be so good that it does not become markedly stained by the washing.

Art. 9. When fish is carried ashore ungutted and gutted in sheds on land, the sheds shall be carefully cleaned and made in such a way that they may be cleaned easily. The floor shall be plain and, where the fish is piled up, covered with racks providing a free flow of water away from the fish. Evisceration and washing shall begin as soon as the boat comes to port. When carrying the fish to the place of destination all rules of cleanliness shall be fully observed.

Art. 10. The fish may never be hooked or pricked with fish-forks or other tools, except in the head. Any such handling of the fish which might lead to bruises or other damage to the fish, shall be avoided.

Art. 11. On boats which are out fishing for more than one day, all fish shall be gutted, and iced in the hold before it stiffens. When iced, round fish shall lie belly down and flat fish dark side down.

Art. 12. The quantity of ice used for icing shall be decided by inspectors.

Art. 13. During the period May 15th to September 30th, it is not allowed to keep fish uniced for more than 12 hours from the time of catching until the boat comes to port.

From October 1st to May 14th, fish may lie uniced in boats up to 24 hours. During the same period the Director of Inspection may allow fish on ice to be kept in boats for longer time than is permissible in the period May 15th to September 30th.

Moreover, it is allowed to keep fish on ice, in the period May 15th to September 30th, longer than stated above, if conditions are particularly good, in the Director's opinion, the boat well equipped for keeping fish and the weather and other conditions are favourable. The Director's permission must be obtained on all occasions.

Chapter III. The Handling of Fish in Quick-Freezing Plants and Their Equipment.

Art. 14. Fish which is taken for filletting must be fresh and undamaged and in all respects perfectly sound merchandise, according to inspector's judgment.

Art. 15. If, during the period May 15th to September 30th, fish has been uniced in boats and is not iced on land, filletting must be finished not later than 24 hours after catching. Fish may, however, never lie uniced on land for more than 12 hours. During the period October 1st to May 14th such fish may lie uniced on land for 24 hours. If caught by trawler, round fish which has not been iced on land, shall be filletted not later than 36 hours after landing, but fish caught on line may lie up to 48 hours. Flat fish may, if required, be kept on ice for up to 3 days on land.

Fish which has been iced in the boat but is not iced on land, shall be filletted not later than 8 hours after landing. Fish which has been iced in the boat and is also iced on land before filletting, may be kept for up to 24 hours on land before filletting, on condition that not more than 3 days have elapsed since the time of catching.

Art. 16. The building in which the fish is kept while it waits for filletting, shall be well finished if made of concrete, or painted if made of timber. In case fish stores are not in accordance with the demands of Director of Inspection, they shall be changed as he decides.

Art. 17. The space on which the fish lies while it awaits filletting shall be such that water can flow freely from under the fish. The fish shall lie on racks which are installed in such a way that they can easily be cleaned under when work is finished.

Art. 18. The oldest fish, or that fish which, in the inspector's opinion is least likely to stand being kept longer, shall be cured first.

The fish shall be washed in washing machines which secure that only fresh water or sea comes in touch with the fish. If a washing machine is not available, the fish shall be washed by brushes and in clean, running water or sea.

Water and sea water, which is used for washing the fish at the freezing plants, shall be clean and uninfected in the opinion of inspectors and the Fish Department of the Faculty of Industries of the University.

Art. 19. Gloves may not be used at filletting unless they are made of rubber or other similar material. If the fillets are not removed from the filleters on conveyor belts, they shall be carried in clean metal pans.

Art. 20. The fish shall be precisely weighed and scales shall be tested with weights at least twice a day. Care shall be taken that the frozen blocks contain at least as much fish as stated on the wrappers.

Art. 21. Packing tables should, best of all, be made of rust-free metal (steel), or other material which is easy to clean. If wooden tables are used, they shall be white-painted. Using gloves of other material than rubber or other similar material, for packing, is not allowed.

Art. 22. If the fillets are wrapped in parchment paper and not laid in cartons, the packages shall be put in the freezing pans without delay or, alternatively, it must be ensured, in some way, that the packages do not get deformed or soiled.

Art. 23. Every package shall bear the freezing plant's mark of identification and such particulars as the production period and other information which the Director of Inspection may demand.

Art. 24. Under ordinary circumstances, fillets must not be kept longer than 3 hours before freezing, unless they are kept in temperature of about 0° Centigrade (32° Fahrenheit). They must, however, never be kept longer than 6 hours.

Art. 25. If multi-plate freezers are used, equal thickness shall be ensured, for example, by installing wooden lists on the edges of the plates.

Art. 26. When fillets are frozen and stored in moisture-vaporproof wrappers, the blocks shall be glazed in clean water immediately on being removed from the freezer. Care shall be taken that the ice-glaze covers the whole block.

Art. 27. Floors of storerooms, where fish is stored after freezing, shall be covered with gratings in such a way that the fish cases stand at least 10 cm (3.94 inches) above the floor, and that air can circulate freely under the piles. The space between the fish piles and the walls shall be at least 15 centimeters (4.13 inches), and if there are freezer pipes on the walls, then fish cases shall stand at least 20 centimeters (7.87 inches) away from the pipes. In the same way there shall be space of at least 20 centimeters between the freezer pipes in the ceiling and the pile. Concerning the loading of frozen fish in ships; similar rules shall be adhered to so that air can always circulate freely round the fish cases.

Art. 28. No smelly articles, or other articles which might have harmful effect on the fish, must be kept in the storerooms. Unfrozen goods must not be brought into the cold stores. All articles or goods which are brought into the cold stores must be about equally cold as the goods which are stored there already.

Art. 29. The temperature in storerooms for fish which is frozen for export, shall be at least 18-20° Centigrade below zero (0° to -4° F.), and shall be kept within these limits as far as possible. The temperature may be lower, however, if it is kept uniform.

In every storeroom there shall be an automatic thermometer or an electric thermometer showing the degree of frost, without the room being opened.

Art. 30. During the loading and transport of frozen fish the cases must be handled as carefully as possible. They must not be trodden on with dirty shoes, or handled with dirty gloves, or soiled in any other way. The cases must not be lifted by the steel straps or wire with which they are reinforced. Care must be taken that they do not get wet. When fish is transported on lorries or boats, it shall be protected against rain and heat with covers or other necessary equipment. The execution of the above shall be in accordance with instructions given by the Director of Inspection regarding the protection of appearances and safety of the fish.

Art. 31. Localities of work, tools, machinery, tables, containers and other equipment used at the curing of fish, shall be carefully washed every day when work is finished. Water supply must be ample in order to facilitate cleanliness. Every freezing plant shall be well stocked with sterilizing substances, approved by the Fish Department of the University, for cleaning working localities and tools when necessary, most preferably every day.

Art. 32. Employees who work on filletting, weighing and packaging shall be tidily dressed. Those who weigh and pack, in particular, shall wear white gowns or white aprons. Women shall wear white caps made of linen or other similar material.

Art. 33. People infected with contagious illnesses must not be allowed to work in freezing plants. Inspectors can demand a health inspection whenever he considers it necessary.

Art. 34. Care shall be taken that utmost cleanliness is observed in the handling of the fish, as far as circumstances allow. Smoking is prohibited in all places where unpacked fish fillets are worked on.

Art. 35. Violation of any of the provisos of these regulations is subject to a fine of kr. 10,000.00 ($1,546.50).

Art. 36. By the above regulations, regulations No. 64 of June 7th, 1944, and No. 103 of July, 1944 on the inspection of frozen fish and iced fish are cancelled, together with other stipulations which are contrary to the above regulations.

The regulations are issued under the authority of Law No. 92 of May 3rd, 1935, on the handling, cure, and export of sea produce, and come into force immediately.

THE MINISTRY OF INDUSTRIES

January 10, 1947

REGULATIONS ON INSPECTION OF QUICK-FROZEN FISH FOR EXPORT

Par. 1. All frozen fish exported from Iceland shall be inspected by inspectors in the service of the Director of Inspection of frozen fish.

Par. 2. In this work the Director of Inspection is assisted by chief inspectors. Their occupation is to travel between the various freezing plants and supervise the production; moreover, to take care of the loading of ships, etc., according to the Director's instructions at any given time.

Chief inspectors shall be engaged by the Minister of Industries, after consultation with the Director of Inspection.

Par. 3. Chief inspectors are responsible, for their work, to the Director of Inspection who, in turn, is responsible for the inspection in its entirety. They shall take care that sub-inspectors (inspectors of the individual freezing plants) do their duty, and ensure that all rules and regulations regarding the handling and the quality of the fish and the equipment of fishing boats and freezing plants are obeyed.

Par. 4. A chief inspector shall visit each freezing plant sufficiently often to be able to keep well informed of everything that concerns the Inspectorate or at least once a week during the main production period of each individual freezing plant, where that is possible.

A chief inspector shall always be present at the loading of ships, in order that he may ensure that all regulations on the handling of the goods are compiled with.

Par. 5. Exporters of frozen fish shall inform the Director of Inspection of the loading ships, which export frozen fish, sufficiently early for the Director to be able to send a chief inspector on board the ship. The Director of Inspection or a chief inspector authorized by him, shall issue a certificate of inspection covering the cargo when he has convinced himself that the regulations have been complied with and that the fish is a sound merchandise.

Par. 6. Chief inspectors shall write detailed reports on their work each day and send them to the Director of Inspection every two weeks. These reports shall include descriptions of all aspects of the inspection. Moreover, they shall include statements of the date of visit to each place, the length of stay, the nature of the work being done, and the chief inspector's criticism. These reports shall be written on forms prepared by the Inspectorate's head office.

Par. 7. Each freezing plant shall have one sub-inspector for frozen fish. His duty is to ensure that all regulations regarding the handling and quality of the fish and the equipment of the plant, are obeyed. In his work he is personally responsible to chief-inspector and the Director of Inspection.

A sub-inspector may occupy other posts at the freezing plant, such as foremanship or any other work, provided that he can, at the same time, perform all his duties as a sub-inspector. He shall always be present when fish is worked on, whatever kind of work that may be. In case he is not able to be present, he shall appoint another man to take his place and bear all responsibility for his work.

Sub-inspectors at the freezing plants shall inform chief inspectors, or the Director of Inspection, without delay, if they are confronted with problems of inspection which they cannot solve.

As long as there is a stock of fish in the plant's cold store, those sub-inspectors who are, at the same time, permanent employees of the freezing plants, such as foremen, shall receive a fee for the supervision, amounting to 20 percent of labourer's wage rates in force at their respective places of work, the time-basis being 25 eight-hour working days each month. The fees are payable by the respective freezing plants.

In case an employee of a freezing plant, who has been a sub-inspector at the same time, neglects his duties as a sub-inspector or is, for some other reasons, not capable of doing his duties as a sub-inspector, the Director of Inspection has power to appoint another man, who attends to the inspection as his sole occupation. The salary of this sub-inspector shall be the same as that of the plant's foreman, and be paid by the freezing plant.

Sub-inspectors shall be authorized by the Chief of Police in accordance with appointments of the Director of Inspection.

Par. 8. Sub-inspectors shall send reports of production in their respective freezing plants, to the Director of Inspection, in such details as he may decide. The Inspectorate provides forms for these reports.

Par. 9. The sub-inspector's reports shall be booked in such a way in the Inspectorate's office, that at any given time there are clear statistics at hand as to the quantity of fish in each freezing plant, the total production of each plant during the year, goods sent away, etc. Moreover, all comments made on the respective freezing plants, shall be booked separately.

Par. 10. The Director of Inspection, chief inspectors or sub-inspectors of frozen fish have powers to stop production, loading, etc. ..., if the quality of the goods is not reasonable or if regulations have not been complied with. Inspectors can prohibit the export of goods if, in their opinion, the handling of the goods has not been in accordance with quality requirements, even if there is not a clear case of a break of regulations.

Par. 11. The Frozen Fish Inspectorate shall be run in collaboration with the Fish Department of the Faculty of Industries of the University, when that (the Fish Department) has commenced activities. The aim of this institution shall be, among other things, to promote knowledge on the quality of the goods and test the effects of diverse curing methods on the merchandise. The Fish Department shall hold courses for inspectors in collaboration with the Director of Inspection, when that is considered necessary. Alterations of the regulations or stipulations regarding handling and curing methods of the fish are subject to the consent of the Department. If the Department considers any such alterations desirable, the Director of Inspection shall be informed, and the Department, in collaboration with him, shall seek the consent of the Minister of Industries to such alterations.

In the case of dispute between the Inspectorate and producers or other parties, regarding the quality of goods, the dispute shall be referred to the Fish Department for settlement.

The Department has power to take or claim from inspectors or producers, samples of fish in whatever state it may wish for, wherever and whenever it considers necessary.

These regulations are issued under the authority of Law of Althing Nr. 92 of May 3rd, 1935, on the handling, cure, and export of sea produce, and come into force immediately.

THE MINISTRY OF INDUSTRIES

January 10, 1947

Japan

PRODUCTION: Estimated fish production for 1947 is 4,000,000 metric tons, more than 2,250,000 tons above the 1946 catch, according to General MacArthur's report on Japan for February. Predictions were that the trend would continue into 1948, when it is anticipated that the production will reach 4,500,000 metric tons. These projected increases hinge on expected gains in consumer goods for fishermen, an increase in fuel oil allocations, and improvements in sardine herring runs.

Mexico

SHRIMP FISHING AND SHARK LIVERS: With the extension of the open season to May 31, shrimp fishing continued in the so-called protected waters in the upper reaches of the Gulf of Lower California, with the Guaymas fleet concentrating in the Kino Bay section, according to the American Consulate at Guaymas, Sonora, Mexico. Shrimp prices remained high with payments to the fishermen averaging over 5,000 pesos ($1,030) per ton, but catches were reported to be very low and many boats failed to make expenses. The freezing plants were unable to maintain production schedules and the season closed in an atmosphere of pessimism.

After a slow come-back following last month's break in price, another break in price occurred during the last week in May in shark livers for the vitamin industry. The volume of the catches was reported low, and with a poor market for low potency livers which represented the bulk of the production, the outlook for this part of the fishing industry is considered unfavorable.

Norway

PRODUCTION: Norway produces more medicinal cod liver oil than any other country. It is estimated that production in 1947 will reach 100,000 barrels, according to the Royal Norwegian Information Services. In April, production was reported as double that in 1946. Export opportunities were reported very good as Norway has trade agreements with many countries. Numerous firms have begun to export medicinal oil in flasks instead of barrels and drums, which has caused great interest abroad.

The Government's freezer in Aalesund has begun to pack frozen whalemeat for export. It is cut in steaks and placed in cellophane in 2- and 10-pound cartons.

The 1947-48 budget states that a rationalizing of industry is necessary to overcome the shortage of labor and indicates that agriculture and fisheries, with their current methods of operation, utilize manpower poorly. In the fisheries, which now employs 100,000 men, the administration has set as a goal to be achieved by rationalization, the catching of the same quantity of fish with 30,000 year round and 10,000 seasonal workers.

RECENT FISHERY PUBLICATIONS

Listed below are informational publications which recently have been processed by the Division of Commercial Fisheries. FL publications are available, free of charge, from the Fish and Wildlife Service, Merchandise Mart, Chicago 54, Ill. Other listed publications may be obtained, also free of charge, from the Division of Commercial Fisheries, Fish and Wildlife Service, Washington 25, D. C.

Number	Title
CFS-335	- Frozen Fish Report, April 1947
CFS-338	- Massachusetts Landings, February 1947
CFS-340	- Vitamin A Report, February 1947
CFS-343	- Fish Meal and Oil, March 1947
CFS-345	- Maine Landings, March 1947
FL-225	- Gear Used in the Sea Scallop Fishery
FL-226	- How Oil and Vitamin A are Determined in Fish Livers
FL-230	- The Japanese Salmon Industry
FL-232	- Fishery Technology Abstract Card System
FL-237	- The Calculation of the Vitamin A Potency of Fish Livers
FL-238	- The Sponge Industry in Turkey
SL-8 (Revised)	- Wholesale Dealers in Fishery Products, Penna., 1946
SL-10 (Revised)	- Wholesale Dealers in Fishery Products, Md., 1947
SL-16 (Revised)	- Wholesale Dealers in Fishery Products, Fla., 1946

Reprints (Separates) from Commercial Fisheries Review, May 1947.

Sep. No. 172 - Moblile Laboratories for Fishery Technological Research
Sep. No. 173 - Studies on the Deterioration of Vitamin A in Fish Livers and Fish Liver Oils--Part II - Loss of Vitamin A Potency and Stability in Frozen Ground Grayfish Livers
Sep. No. 174 - New Type Thermocouple Seal for Tin Containers
Sep. No. 175 - Some Observations on Fish Processing in Norway

Designations for fishery publications are interpreted as follows:

CFS - Current fishery statistics of the United States and Alaska.

SL - Statistical lists, consisting of lists of dealers of fishery products and manufacturers of byproducts.

FL - Fishery leaflets.

MDL - Market development lists of frozen food locker plants and locker associations.

Editorial Assistant -- Bessie B. Johnston Compositors -- Jean Zalevsky and Norma C. Dressler
Illustrator -- Shirley A. Briggs Processing -- Miscellaneous Service Division

FISH FOR BREAKFAST--AND WHY NOT?

In addition to nutritional qualifications, fish have other important advantages as breakfast dishes. They cook rapidly and, when fresh and properly handled, have a delicate yet distinctive flavor. The economy of fish depends to some extent on the skill and judgment of the purchaser. Most people have become accustomed to, and demand, only a few species of fish which are comparatively scarce, and which, therefore, demand a higher price. If the homemaker were to shop around, she would find any number of less well-known but equally delicious fish and at a lower price than she is accustomed to paying. Even the inland markets may now boast a large variety of constantly available seafood due to the rapid development of the quick-freezing industry and to the growth of the otter trawl fishery.

When first confronted with the idea of fish for breakfast, one may wonder how to fit them into the more or less standardized breakfast menu. Codfish cakes, kippered herring, and finnan haddie have long been accepted breakfast fare in certain localities and by certain groups of people, so the fish for breakfast idea is not really new and strange. A few sample menus and recipes may serve as an inducement for serving seafood at breakfast, and when the success of the introduction merits it, the housewife will continue its use and will herself employ fish to create a variety of breakfast dishes.

--Fishery Leaflet 247

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